AN

ANALYSIS

OF THE

MINERAL WATERS

OF

SARATOGA AND BALLSTON,

WITH PRACTICAL REMARKS ON THEIR

MEDICAL PROPERTIES;

TOGETHER WITH A HISTORY OF THE DISCOVERY AND SETTLEMENT OF THESE CELEBRATED

WATERING PLACES,

AND OBSERVATIONS ON THE

GEOLOGY AND MINERALOGY

OF THE

SURROUNDING COUNTRY.

BY JOHN H. STEEL, M. D.

"The Lord hath created medicines out of the earth, and he that is wise will not abhor them."—BIBLE.

AN ENTIRE NEW WORK.

Saratoga Springs:

PRINTED AND PUBLISHED BY G. M. DAVISON.

1831.

TO THE

NEW-YORK

HISTORICAL SOCIETY;

Formed for the express purpose of eliciting and preserving whatever may relate to the Physical History of the state, this Analysis of some of the most distinguished and celebrated Mineral Waters which our country any where affords, is respectfully inscribed,

By the

AUTHOR.

Saratoga Springs, July 1, 1831.

PREFACE.

In presenting to the public a new work on the mineral waters of Saratoga, some explanation may be deemed necessary.

These waters had been considerably resorted to, and had become quite celebrated for their medicinal qualities, particularly about the country, long before any thing more was known of their properties than what was gathered from the effects which they produced, when taken into the stomach.

Dr. Seaman, of the city of New-York, who visited the place as early as 1793, undertook, while on the spot, some chemical experiments on the water, in order to determine its real character; and to him the public are indebted for the first scientific effort ever made to elucidate its true properties. His publication contained much useful information on the subject, but his experiments were limited to only one of the fountains, and his deductions were not always conclusive. Several other

scientific notices of the waters were subsequently published by able chemists, but they were not more successful in producing satisfactory results; and, although they went far to corroborate the opinions and views of the Doctor, they afforded no additional information to that which he had previously acquired; so that the discreet physician, when called upon to direct the use of the waters, was frequently at a loss, and for the want of proper information, unable to decide, in many cases, as to the propriety or impropriety of prescribing their use.

In the summer of 1817, I first published some observations on the mineral waters of Saratoga and Ballston. At that time, I had resided at the Springs something over ten years, and having been, during that period, often consulted in relation to the qualities and uses of the waters in various diseases, I felt compelled to engage in a course of inquiries, which would lead to a better and more satisfactory understanding of the general character and compar-

ative properties of the different fountains; and if the little work, which resulted from the undertaking at that time, was not sufficiently minute and discriminating in its details to satisfy the profound chemist, it was thought, at least, to contain all that was important for the instruction of the physician, or the benefit of his invalid patient.

Since that period, several analyses of the most celebrated fountains have at different times appeared, under the sanction of names calculated to inspire the fullest confidence in their correctness; but the glaring discrepancies manifested in the results, have tended greatly to lessen that confidence, and to involve the subject in uncertainty and doubt.

It therefore became necessary that a more careful and accurate investigation of the properties of these waters should be made, in a way and manner calculated to establish their real character, and, if possible, to settle the public mind on the subject.

Having spent more than twenty years of my professional life on the spot, and having been compelled to devote almost the whole of my attention, particularly during the drinking season, to the operation and effects of the waters, in the various and complicated diseases which have, at different times, presented themselves at the Springs, I was impelled, by a sense of duty which I owed to the public, as well as to the very respectable individuals who have heretofore honored me with their attentions, to make the subject an object of my particular and minute investigation; and for several years past, the examination has employed the whole of my leisure hours.

Availing myself of all the sources of information which the present state of science on this subject afforded, I commenced the arduous undertaking, with a determination that no labor, at least, should deter me from arriving at as great a degree of accuracy as the subject would permit; and the result of a patient and laborious

investigation is now presented to the public, under an impression that the accuracy of the conclusions will not be controverted by those who have the means, and will take the trouble to examine for themselves.

By comparing the present analysis of the waters of the several springs, with that which I formerly published, a considerable difference in the results will be readily discovered. This, however, must not be imputed to any alteration or change in the original properties of the waters, but is accounted for, in a great measure, by the different state or condition in which the various saline ingredients, afforded by the water, were, by the different processes, obtained. In my former analysis the whole of the saline residuum was estimated while in a state of crystalization; in the present instance, the quantities are calculated in a perfectly dry state. There are other differences of a less important character, which unquestionably arise from errors committed in the former analy-

sis, which, I am now happy in the opportunity to acknowledge, as well as to correct.

Under an impression that every thing relating to the early history and settlement of the springs, is becoming every day more and more interesting, as the place advances in importance, I have endeavored to give as full and perfect an account of it as I have been able to collect. For this, I am greatly indebted to a number of individuals; particularly to John K. Beekman, Esq. of New-York, who kindly furnished me with several valuable documents, in relation to the early history of the celebrated patent Kayaderosseras.

I am likewise under particular obligations to Dr. Samuel Freeman, of Ballston Spa, for the particulars in relation to the history of that place, as well as for many useful practical observations on the medical properties of the waters. Dr. Freeman has resided on the spot for a number of years, and his knowledge and experience entitle his opinions to the fullest confidence and respect.

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Saratoga is, in all probability, a corruption of the Indian word, Sah-rah-ka, which is said to mean "the side-hill," and was applied by the natives more particularly to that part of the country which lies between the Lake and the Hudson, where the application of the term is amply justified in the appearance of the country.

The whole country which seems to have inherited the name is of much greater extent. It embraces a tract of country which, commencing at the mouth of the Mohawk river, stretches to the north along the windings of the west bank of the Hudson for more than seventy miles, to the county of Warren ; thence in a westerly direction to the east bounds of the county of Hamilton, about fifteen miles ; from this spot the line proceeds in a southerly direction along the whole extent of the east

line of the county of Montgomery, about thirty miles, to the north line of the county of Schenectady; thence along the line of Schenectady to the Mohawk river, which separates it from the county of Albany, and then along the course of the Mohawk to the place of beginning, about twenty-five miles.

These lines include an area of about eight hundred square miles, and a population at this time of about forty thousand souls.

The greater part of the lands included in this tract were originally granted by the crown of England to a company of thirteen proprietors, under the title of the *Patent of Kayadaroseros.*

The Van Schaick's Patent, so termed from the name of the person to whom it was granted, was of an earlier date, and included the present town of Waterford and a considerable tract of country adjoining. The Saratoga Patent was next in order, and embraced an extent of six miles square along the Hudson some miles above Van Schaick's Patent. The Apple Patent was still later; it was granted to one William Apple, and was located on the Mohawk, and extended "*three miles back into the woods*" towards Ballston Lake.

The history of these grants, their settlement and the subsequent intercourse with the natives, would form an interesting document in the history of the country. Even at this late period, many important facts, hitherto undisclosed, might be brought to light from living witnesses, which a few more years will place beyond the power of the historian to recover.

The mineral waters which form the subject of the ensuing treatise being situated principally in the great Patent of Kayaderosseras, it will not, I trust, be deemed uninteresting by most readers to be made acquainted with the history of that grant, particularly as it may tend to disclose the true estimate which the native proprietors placed upon these "health preserving fountains," if indeed they were known to them at all.

The first grant, of which there is any record, of land in what is now called the Patent of Kayaderosseras, in the county of Saratoga, was made by two Indians, who, in the conveyance which they gave, styled themselves "Maquaes Indians, owners and native proprietors of the land." They are thus described in the original indenture: "Joseph, the Indian, by them called Te-jon-nin-ho-ge, and

Hendrick,* by them called De-han-och-rak-has, principal owners," &c.

This conveyance was made "for and in consideration of divers goods" to David Schuyler and Robert Livingston, junior, yeomen of the city of Albany, and is dated at Albany, the twenty-sixth day of August, in the first year of her majesty's reign, (Queen Anne,) Anno Domini, 1702. The boundaries are thus described :

"Beginning on the west side of Hudson's river above Sar-ogh-to-ge's Patent ; beginning opposite the creek, called by the Indians, Ti-on-un-do-ga-he, and running along said side of the river above the second carrying place to a small island in said river,† and westward into the woods as far as their property belongs, together with all and singular," &c.

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* This Hendrick is the same who distinguished himself in the subsequent wars under General William Johnson, and was slain with Colonel Williams, in 1755, in an attack on a body of French and Indians near *Bloody Pond*, not far from the head of Lake George, being then upwards of seventy years old.

† This spot is described in another place thus: "From the north bounds of the said Sarogtoge's Patent to a place above the falls that lieth in Hudson river above the Carrying Place that goes over to the Wood Creek which leads the way to Canada."

In the spring following, Samson Shelton Broughton, Esquire, attorney-general of the province, in behalf of himself and company, obtained a licence to purchase the "tract of vacant and unappropriated land in the county of Albany, called or known by the Indian name of Kayadoroseros, adjoining to the north bounds of Schonectady on the east side thereof, to the west bounds of Soroctoga on the north side thereof, and to Albany river on the west side thereof, of the native Indians and proprietors thereof, for their cultivation and improvement."

This licence was granted by his excellency, Edward Viscount Congbury, captain-general and governor-in-chief of the province of New-York and territories depending thereon in America, and vice-admiral of the same. It is dated at Fort Ann, in council, in the city of New-York, the twenty-second day of April, A. D. 1703.

In pursuance of this licence a purchase was effected of the Indians, Joseph, Hendrick, Cornelis, Gideon and Amus, owners, proprietors and "native Maquaes Indians and sachems, in behalf of themselves and all their nation, for and in consideration of the sum of sixty pounds ($150) current money of the province of New-York, and

of sundry goods to them in hand paid," &c. "by Samson Shelton Broughton, Esquire, attorney-general of the province, Peter Fauconnier, Esquire, late commissioner of the customs, and Naning Hermanse Visher, of the city of Albany, mariner, for themselves and company." The bounds of the tract thus granted are summed up and recapitulated in the original deed thus :

"The aforesaid tract of land being bounded below the *All-Place* and Schonectady river on the west by said river, then by the said township's bounds round about to said river again, and still westward above the said town by the said river again for eight miles at least above Twek-to-nondo-hill ; thence by a north and northeasterly line to the headmost spring of the stream called Kayadaroseras river, and still northerly by a north line continued to be run eight miles further up into the woods, and yet still northerly by a north or northeasterly line run from thence to Albany river above Sar-og-to-ge, by the township of *Sorogtoge*, and round the same to said river again ; thence by said river to Anthony Van Schaick's northeasterly corner, and southerly by a line run from thence to the northwesterly corner of Nestiguione (Niskayuna) on Schonectady river, the place of beginning."

This deed is dated at Albany, the sixth day of October, in the third year of her majesty's reign, A. D. 1704, and is signed by all the sachems above named, except Cornelis, whose name does not appear among the signatures.

Immediately after this, a relinquishment of the claim of Schuyler and Livingston was procured by Visher in behalf of the company, for which they were to receive a certain portion of the lands when the patent should be perfected, or in lieu thereof the sum of £100 ($250) in money. On the back of this agreement is endorsed a receipt signed by Livingston and Schuyler, for £90 in full satisfaction for the condition.

These preliminaries being adjusted, the patent was sued for and finally obtained. It was granted by Queen Anne in the seventh year of her reign, and is dated the second day of November, A. D. 1708. The grant was to "her loving subjects, Naning Hermanse, Johannes Beekman, Rip Van Dam, Ann Bridges, May Bickley, Peter Fauconnier, Adrian Hogelandt, Johannes Fisher, John Tuder, Joris Hogelandt, John Stevens, John Tatham and Samson Broughton," and is "for all that tract of land situated, lying and being in the coun-

ty of Albany, called *Kayadoroses,* alias *Queensborough.*"

The bounds of this extensive tract of land which has become so interesting to the present generation, are here copied verbatim from the original patent :

"Beginning at a place on Schonectady river* about three miles distant from the southwesterly corner of the bounds of Nastiguione, the said place being the southwesterly corner of the patent lately granted to Naning Harmense, Peter Fauconnier and others ; thence along the said Schonectady river, westerly to the southeasterly corner of a patent lately granted to William Apple ; thence along the easterly, northerly and westerly line of the said Apple's Patent down to the above said river ; thence to the Schonectady bounds of the southeasterly corner of the said patent, on the said river, so along the easterly, northerly and westerly bounds thereof down to the said river again ; thence along the said river up westerly to the southeasterly bounds of a tract of land lately granted to Ebenezer Wilson and John Abel, and so along

* This river in another place is styled "Schonectady, Mohaks, or Maqueas river."

the said patent round to the southwesterly corner thereof on the said Schonectady river to a place or hill called *Twactononda*, being five miles distant, or thereabouts, from the said southwesterly corner of the said Wilson's and Abel's Patent; thence along northerly to the northwestmost head of a creek called Kayadoroses, about fourteen miles, more or less; thence eight miles more northerly; thence easterly or northeasterly to the thirds falls on Albany river, about twenty miles, more or less; thence along the said river down southerly to the northeasterly bounds of *Saroghtoge;* thence along the said Saroghtoge's northerly, westerly and southerly bounds on the said river; thence to the northeasterly corner of Anthony Van Schaick's land on the said river, so northerly and westerly along the said Van Schaick's Patent to the northeast corner of the above said patent granted to Naning Harmense, Fauconnier and others; thence along the northerly and westerly bounds thereof down to the above said river of Schonectady, being the place where it first began."

The consideration for all the lands contained in the foregoing limits, was merely £4 ($10) quit rent to be paid, in current money of the state of New-York, yearly forever, on the "*Feast* day of the annonciation of our blessed Virgin Mary, (common-

ly called Lady Day,") to the collector or receiver-general at the custom house, in the city of New-York ; the crown reserving to itself all gold and silver mines, and conditioning that one or more settlement on some part thereof should be effected within *seven years* from the date of the said patent.

This last stipulation was entirely neglected until the seventeeth of October, 1715, when the company becoming alarmed at the prospect of forfeiting the patent from this neglect, the major part of them entered into an agreement with Naning Hermense, of Albany, to effect a settlement on the said lands, on or before the first day of May ensuing, and he was to receive in consideration for his services, one thousand acres of land over and above his share, to be located any where in the patent, excepting on the Kayaderosseras creek, where, it seems, the lands were held in much higher estimation than in any other part of the tract.

It does not appear, from any documents which I have the means of examining, where the first settlement was made ; but it is highly probable, from the frequent discomfitures among the remote settlers occasioned by the incursions of hostile Indians in the vicinity, that the first settlers did not remove very far into the interior ; doubtless they

were located in the vicinity of Schenectady or along the north side of the Mohawk.

On the Hudson, settlements might have been made much earlier, particularly on the patents of Van Schaick and Saratoga; but it does not appear that there were, at the period to which we allude, (1715,) any settlements above the patent of Saratoga, that is, north of the Fish creek, or what is now called Schuylerville; and there could have been but a few scattering inhabitants between that and the Mohawk. It was in the year 1747 that the town of Saratoga was burnt by the Indians, and the inhabitants, consisting of about thirty families, were mostly massacred;* and about the same time the family of Kettles were murdered by the savages. This latter circumstance forms the subject of a story, interestingly told by Mrs. Ten Eyck. The place where the family resided was but six miles above Waterford, immediately on the bank of the Hudson, nearly opposite to what is called the lower borough in Schaghticoke, and on the farm lately owned by John Ten Broeck, and

* This settlement was at the mouth of Fish creek, where Schuylerville now stands, and a gentleman by the name of John Schuyler, one of the ancestors of the present proprietor of that village, was among the slain.

more recently by one Strachan. The ruins of the cellar were visible, and a few aged fruit trees, said to have been planted by the family, were in blossom, when I last visited the place, a few years since.

From the period above alluded to until the final conquest and consequent subjection of the province of Canada to the British government, the progress of emigration to this part of the country, which was then an exposed frontier, was greatly retarded.

During the summer of 1755, the fort was commenced and completed at Fort Edward, which was then called the "*Great Carrying Place*," and at the same time a road was cut through the woods to the head of Lake George, where the Fort William Henry was commenced and a small garrison established at both places. This added greatly to the security of the settlements to the south ; but it was not until the arrival of General Amherst in the year 1759, who passed up the Hudson and through the lake to Canada, and completed the subjugation of that province, that the incursions of the hostile Indians were effectually checked, and complete security restored to the frontier settlers.

From this period the country began to be more rapidly settled; the settlements however were principally confined, for several years, to the banks of the Hudson or the Mohawk. The extreme fertility of the soil, the advantages of mill seats, and the facility of cutting timber, gave to the neighborhood of these and their tributary streams, an advantage that was not to be overlooked by the adventurous and enterprising emigrants.

At what precise period of time the mineral springs, which have now become so important in the history of the country, were discovered and their properties first observed, cannot now, with any degree of certainty, be ascertained. It is but reasonable, however, to infer that the discovery was sometime subsequent to the transfer of the title by the natives, as that circumstance took place without any intimation as to the fact of the existence of such waters, which could hardly be supposed to have happened had any importance been attached to their properties, or had they, indeed, been known to exist at all; and it is equally probable that those to whom the transfer was made were likewise ignorant on the subject, for they made, some years afterwards, grants to individuals with the privilege to locate *any where* except on the flats of the Kayaderosseras.

The fame which this part of the country had long sustained as a hunting ground must have attracted the attention of those who occupied themselves in the labors of the chase at a very early period, and it is highly probable that an object so singular and conspicuous as the High Rock would have presented itself to the attention of some of these adventurers at a much earlier period than is now generally known ; but whatever might have been the knowledge of individuals, it is certain that but little general information had been diffused on the subject until about the year 1767.

General William Johnson, who had retired from his command in the army with the title of *Baronet*, conferred by his majesty as a special favor for his brave defence of Fort William Henry, now resided at Johnstown, about thirty miles west of the Springs, in the capacity of Indian agent. Sir William being indisposed* and finding little or no benefit from the application of such limited means as his situation enabled him to apply, was induced, at the instigation of the Indians, with whom he was

* Sir William was wounded in the defence of the garrison of Lake George, and the wound, although slight at first, continued to trouble him the remainder of his days.

always a great favorite, to undertake a journey to the Springs, and in the month of June or July, he set out on the expedition. They passed down the Mohawk to Schenectady, from whence they travelled through the woods to Ballston Lake; here they tarried over night at the hut of one Michael McDonald, a Scotch adventurer, who, with a young family, had just commenced a settlement in the midst of the wilderness.*

On the following day, accompanied by McDonald and his Indian guides, Sir William arrived at the High Rock Spring, then the only one known; here he remained a number of days, being well supplied with provisions by the dexterity of his hunters, and regaling themselves with large potations of the water, of which the whole company soon became remarkably fond.

At the termination of his residence here, Sir William's health became perfectly reinstated, and although he had been brought to the place the greater part of the way on a litter borne on the

* McDonald continued to reside on the same spot, until a few years since, when he died, being upwards of eighty years old, leaving a fine well cultivated farm as a patrimony to a large family.

shoulders of the Indians, he was enabled to travel back to Schenectady on foot.

The fame of this extraordinary cure on a personage so distinguished as Sir William, soon spread over the country, and from this period "THE SPRINGS" began to be the resort of invalids.

In the year 1770 and '71 several families located themselves on the highlands on the east side of Saratoga Lake, a little to the southeast of Snake Hill; and about the same time John Laing, Roland Perry and John Stiles settled at Palmertown, (now Wilton,) about six miles northeast from the Springs. From these settlements excursions were frequently made to the High Rock through paths that were only passable on foot.

In the year 1773, one Dirck Scowton, influenced by a desire to trade with the Indians as well as to afford accommodations to visitants, commenced a settlement on the high bank a little west of the High Rock on the spot where Bentley's tavern now stands. Here he cut down a few trees, and with the assistance of several persons who accompanied him for the purpose, they were rolled up to form a hut; but before he had time to render it sufficiently comfortable for a dwelling, ow-

ing, as it was said, to some misunderstanding with the Indians, he was induced to abandon his project, and it is believed that he never afterwards returned.

During the following season one John Arnold arrived from the state of Rhode-Island, with a young family, at the east side of Saratoga Lake, and from the representations made to him, he was induced to try his fortunes at the Springs. Having provided himself with a few articles suitable for Indian traffic, consisting mostly of spiritous liquors, he embarked his little stock in trade, together with his family and a few necessary articles of furniture, on board of a canoe near Snake Hill, paddled across the lake and up the Kayaderosseras creek about two miles; here he landed, and taking their goods upon their backs, they followed a foot path which conducted them through the woods to the Springs.

On their arrival, Arnold took possession of the house that had been built by Scowton, and having improved it so as to render it comfortable for his family, he opened a kind of rude tavern.

Mr. Thomas Arnold, a highly respectable farmer, is now living in the town of Stillwater, about eight miles from the Springs. He is the son of

John Arnold, and accompanied the family during their residence at the place, and although but nine years old at the time, retains a perfect recollection of the appearance of the country and the circumstances relating to his father's residence here.

The valley along the brook was covered by large trees of hemlock, elm and maple; and the bank on the west side of the valley with a thick growth of overgrown white pine, while the opposite side was a perfect thicket of yellow and pitch pine.

The High Rock and Flat Rock were the only springs at that time known. The hole or opening at the top of the High Rock was at times nearly filled with water, but this only happened in wet seasons or during long periods of wet weather. The water usually stood some inches below the top of the hole where its surface was in a constant state of agitatation. This agitation, when the hole was nearly full of water, would, at times, cause it to surge over and run down its sides, but this very seldom happened. There was nothing like a *constant* discharge from the top of the rock at any time. The water, however, was at all times so

high as to be easily dipped with the hand.* There were the remains of a small hut or cabin near the rock, probably the one built by Sir William Johnson.

The Flat Rock covered a quantity of ground of several rods in extent; it was considerably elevated above the marsh or swamp which surrounded it; the surface was flat and hard, and was perforated in numerous places, where the water stood in little pools, through the bottom of which it was constantly bubbling up. The marsh and grounds about the rock were much broken and trodden up by the footsteps of wild animals which flocked here in great numbers to drink of the water, of which, there is every reason to believe, they were voraciously fond. Deer and moose would, at times, when in pursuit of this beverage, apparently loose their wildness and suffer themselves to be closely approached, and they were frequently shot by the Indians, and other hunters, while regaling them-at this fountain.

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* This rising and falling of the water in the rock gave origin to the opinion entertained by the first visitants, that it "*ebbed* and *flowed* with the tide." The water, although now some feet below the top of the rock, still continues to rise and fall with the state of the season, as any one may observe who will take the trouble to measure it at the proper times.

The woods abounded with wild game. Bears, deer, wolves and moose were seen almost every day; and the small stream which runs through the valley was the abode of beaver and great quantities of salmon trout.

There were sixteen cabins occupied by different families of Indians, all in sight of Arnold's house. These Indians were principally employed in hunting and fishing, and although frequently intoxicated, they were generally inoffensive and friendly.

There was a small clearing on the top of the hill south from where the Union Hall now stands. This was probably the first cleared spot in the vicinity of the Springs. It was said to have been done by a man who went by the name of Indian Joe, a half blood, who resided among the Indians in the neighborhood.

On the approach of winter, Arnold shut up his house and went over to the settlement on the east side of the lake, but returned early in the spring and resumed his business, which he continued, however, till fall only, when he again left the place. He was succeeded by one Samuel Norton, who had previously obtained a permission

from Isaac Low to occupy and improve a farm in the vicinity of the "salt spring" at Saratoga, under a stipulation to receive pay for his improvements should he think proper at any time to remove. Low had acquired his title to the soil by purchase from the heirs of Rip Van Dam, to whom, on the general partition of the patent, this portion of it devolved.*

Norton took possession of the house the same season that Arnold left it, and continued to make considerable improvements by clearing up the land, &c. through the succeeding season. But the war, which had already commenced, was now becoming every day more and more serious, and he began to be alarmed for the safety of his family, and thought it prudent to remove them from a situation where they were so much exposed to the aggressions of the contending parties. He finally joined the British army, where he soon after died, and the Springs were again left without a single inhabitant.

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* In 1770 the patent was divided, and lot number twelve, (which includes the mineral waters and a considerable portion of the adjoining lands at Saratoga Springs,) in the sixteenth general allotment, was sold by the representatives of Rip Van Dam to Anthony Van Dam, Jacob Walton and Isaac Low.

Low absented himself from the county during the war, and his lands were of course sold by the commissioners of forfeitures; those which he owned at the Springs were sold to Henry Livingston in 1786, for himself and brothers.

In the spring of 1783, a son of Norton resumed the occupancy of the former possessions of his father at the Springs, and continued to clear and improve the land in the vicinity until the year 1787, when he sold his possessions and improvements to one Gideon Morgan, who the same year transferred them to Alexander Bryant. Bryant must be considered the first permanent settler here; he built a blacksmith's shop, and erected an additional log house which he opened for the accommodation of visitants; and there are persons yet living who recollect with peculiar pleasure, the clean apartments and *comfortable* accommodations afforded by the proprietor of this humble mansion.

In the year 1783, General Philip Schuyler, who had a farm and a number of mills at the mouth of the Fish-creek, caused a road to be opened from that place to the Springs, and having set up a large wall tent near the High Rock, occupied it with his family for the space of three or four weeks. They were so well pleased with the result of this visit,

that the following season he caused a small frame building to be erected on the high land a little southwest from the High Rock, where he continued to reside five or six weeks every year during the remainder of his life. This house was standing until a few years past; it consisted of two rooms, with a stone fire place and chimney; it was enclosed and lined with rough boards, and was the first framed house built in the place.

In the year 1789 a Dr. Blakesley and Gideon Putnam commenced a settlement at the Springs. Blakesley occupied the log building erected by Scowton, and Putnam located on a new farm three fourths of a mile westerly from the village. It is to the enterprize of this latter gentleman that the village is indebted for much of its early improvement, and the public for the first elegant and commodious accommodations which the place afforded.

In the year following, (1790,) Benjamin Risley, Esquire, from Vermont, bought the house which Scowton built, and having erected some additions, opened it for the accommodation of visitants. This, and the house kept by Bryant on the opposite corner, and but a few rods distant, continued to be rival establishments for a number of years. Risley, a few years after, built the yellow

house near the upper end of the village, which has been occupied as a tavern ever since. He likewise built a small house on the opposite side of the street, nearly against the yellow tavern, which was occupied for a time as a boarding house, but was, some years since, burnt down.

About the year 1794, the Messrs. John and Ziba Taylor opened a small store in one of the rooms of Risley's house. They afterwards built a small log house which they occupied for the same purpose; this stood on the high land, forty or fifty rods north from the High Rock Spring, but every vestige of it has long since disappeared. These gentlemen subsequently erected mills, and contributed much to the clearing and improving the surrounding country.

During the summer of 1792 the Congress Spring was first discovered. Three gentlemen were boarding at Risley's who frequently amused themselves by hunting for small game in the neighboring woods. One of them by the name of Gillman, from Exeter, New-Hampshire, who either was at the time, or had been a member of congress, accidentally discovered a small stream of water issuing from an aperture in the side of a rock the face of which formed the border of the brook. An appearance so

singular attracted his attention, and on examining it more attentively he found it to be a strong mineral water. He communicated the discovery to his associates, and in the afternoon of the same day he conducted his landlord, together with a number of other persons, to the spot. It was situated a few feet further west and on the opposite side of the brook from where the Congress spring now is. The water issued from an aperture which resembled a worm hole in one of those large masses of siliceous lime rock which form the upper stratum of the rock formation at this place. Its taste and other sensible qualities satisfied the company that the discovery was an important one; and the spring was immediately dignified by the consent of all the persons present, with the name of the CONGRESS SPRING, out of respect to the discoverer, and as a compliment to the superior strength of its waters.

About the year 1770 it is said that a Dr. Constable, who resided at Schenectady, examined the waters at Saratoga and Ballston, and pronounced them highly medicinal; and in 1783, Dr. Samuel Tenney, a regimental surgeon stationed at Fish-creek, visited the Springs, and made some interesting and judicious remarks on their properties and uses as a medicine. The result of his obser-

vations he addressed in a letter to Dr. Joshua Fisher, of Boston, which was subsequently published in the Memoirs of the American Academy of Arts and Sciences, vol. II, part I, 1793.

The venerable Samuel L. Mitchill, LL. D. of the city of New-York, records it as one of the remarkable incidents of his life, that in the year 1787, he "visited the Springs at Saratoga while surrounded by the forest, and ascertained experimentally that the gas extricated from the water was *fixed air*, with the power to extinguish flame and destroy the life of breathing animals."

It does not appear, however, that there was any attempt at a scientific examination of these waters until the year 1793, when Valentine Seaman, M. D. then one of the surgeons of the New-York Hospital, and an eminent physician of the city, published "A Dissertation on the mineral waters of Saratoga." His chemical experiments were principally confined to the water of the High Rock spring; and to him very justly belongs the honor of first developing the true character and qualities of these interesting fountains. From the result of his enquiries he inferred and published his views on the "use and medical virtues of the waters." In the year 1795, Dr. Vandervoort published the

result of his experiments on the waters of Ballston.

These publications had the effect to produce a more general knowledge of the properties of the waters, and to confirm the good opinion which many had already formed of their efficacy in many complaints. The consequence was an increase of company to such an extent as to evince the necessity of more extensive and better arranged accommodations. Influenced by this consideration, Mr. Putnam, whose enterprize was always active, was induced to build a large and commodious house near the Congress spring, around which, at the time, the country was a perfect wilderness. He commenced it in 1800, and in the spring of 1802 the Union Hall, then called Putnam's tavern, was opened for company. It consisted of a large dining room, two parlours and a commodious kitchen on the first floor, and the two upper stories were divided into lodging rooms.

In 1808, Jotham Holmes, who had before kept a house near the High Rock, commenced building the Columbian Hotel near the Flat Rock, and the following season it was opened for company. The success which attended these first efforts induced Mr. Putnam to extend the means of accommoda-

tion still further. He added considerably to the dimensions of the Union Hall, and in 1812 commenced the Congress Hall on the opposite side of the street; but before it was completed, its worthy and enterprizing proprietor died, and the completion of the building was consequently delayed until the fall of 1814, when it was sold to Graudus Van Schoonhoven, who finished it, and in the spring of 1815 it was opened.

From this period, the character of the waters, and the excellency of the accommodations afforded to visitants, began to be more generally known and more justly appreciated; and the little village, as it emerged from the surrounding wilderness, began to present the appearance of a place of fashion and extravagance, and from being the mere humble abode of the indigent and infirm, suddenly became the resort of the most polite and polished society. Such was the rapid increase of company, that it became necessary that still further accommodations should be provided; and in 1819, the Pavilion was opened by Mr. Lewis, and in 1824 the United States Hotel by Mr. Ford. All these establishments have from time to time been enlarged and improved, until they may be ranked among the most spacious and imposing buildings of the kind in the United States; and for good fare

and polite attentions, will not suffer by a comparison with those of any country.

The village was incorporated by an act of the legislature in the spring of 1827. It contains about two hundred dwelling houses, five meeting houses or places for public worship, a printing office, reading-room and circulating library, together with a number of stores, groceries and mechanics' shops, and numbers about fifteen hundred inhabitants. It possesses no peculiar advantages either for manufacturing or mercantile pursuits; it is therefore indebted alone to its character as a *watering place* for the advances which it has heretofore made in improvement and population.

The village is situated at the termination of one of the spurs of the immense pile of primitive mountains which separate the waters of Lake Champlain from those of the St. Lawrence. It is twelve miles west from Schuylerville on the Hudson, and thirty east from Johnstown in the coun- of Montgomery; it is thirty four miles northerly from Albany, and twenty seven southerly from Lake George. Its principle street is one hundred and forty feet in width and nearly one mile in extent. The houses are well built, and the whole village has an air of neatness and salubrity seldom

equalled in any country village. Formerly the inhabitants were subject to attacks of intermittent and remittent fevers, but for the last ten years these diseases have entirely disappeared. This remarkable exemption is imputed to the destruction of a number of mill-dams in the surrounding country, and the clearing and draining of the low marshy grounds in the immediate vicinity of the place, which must, during their existence, have afforded fruitful sources for those exhalations, to which has always been imputed the origin of these afflicting diseases. Nor is the surrounding country less exempt from those pestiferous exhalations which render a place insalubrious and improper for even the temporary residence of invalids. The springs are situated in an elevated district, and in the immediate vicinity of any extensive range of mountainous country; the atmosphere, therefore, is remarkably pure and invigorating, affording to the diseased one of the best selected spots that could be chosen for the improvement of a broken or impaired constitution.

But Saratoga is not only interesting on account of the salubrity of its waters and the purity of its air; the name is associated with the great events which gave birth to the empire; her plains are distinguished in the history of freedom. It was here

our fathers fought and bled ! and here the sight of their graves daily reminds us of their valor and their patriotism. It was here, during the dark and gloomy period of the revolution, that the light of liberty first dawned upon our then benighted land, and cheered the hearts of our desponding countrymen with a full prospect of a great and glorious day ; and although the bones of those who fell upon her plains are now scarcely distinguishable from the earth which covers them, yet the spot of their repose will be sought after and remembered while patriotism shall have a votary, or liberty a name. The scene of the defeat and surrender of General Burgoyne is but two hours ride from the Springs, and is full of interest.

The falls of the Hudson are numerous, and some of them highly interesting, particularly those of Baker, Glen and Hadley; they are situated about eighteen miles from the Springs, and are well worth the attention of the tourist.

Saratoga Lake is but four miles distant from the Springs. It is a beautiful sheet of pure water, nine miles in extent from north to south, and from one to three in width. The scenery around it is diversified and highly picturesque, while the lake itself abounds with a variety of fish and its borders

with abundance of small game, affording to the sportsman and epicure a never failing source of amusement and gratification.

Lake George, twenty seven miles distant, presents a scenery sublime, beautiful and romantic beyond description. Here the invalid may not only be exhilirated by the delightful prospects which surround him, but will find himself invigorated by inhaling the pure air of the mountains, and bathing in the limpid and uncontaminated waters of the *Sacred Lake.**

The artist may here occupy his pencil in delineating some of the grandest views which the United States any where present, and which fancy in her wildest and most extravagant exertions can never imitate or improve. Indeed, no being, endowed with reason and common sense, can ever visit this spot without receiving impressions calculated to elevate his views of the divinity of nature, and the dignity and grandeur of her works.

The roads leading to all these places are tolerably good, particularly where they pass over the

* The French, who first discovered the lake, gave it the name of "*Lake Sacrament*," from the purity of its waters.

plain country; as they are there not only level and dry, but frequently hard and smooth in consequence of the admixture of loam with sand. The invalid may, therefore, select such route from the Springs as may best suit the state of his health. If feeble or afflicted with painful disease, he may ride on the plains without fatigue: or if more vigorous and courting exercise, he may mount the hills in Greenfield to the north, where, in a tour of eight or ten miles, he may enjoy a mountain scenery.

The establishment of a line of steam-boats and stages from New-York to Montreal, by the way of Lake George and Lake Champlain, places the Springs in the great road between those two cities; their importance, therefore, as a resting place will be much enhanced, as travellers between those great marts (from both which they are nearly equi-distant) may gratify their curiosity, without deviating materially from their route, and enjoy while there a constant and convenient intercourse with either place.

[Since the foregoing was written, a company has been chartered by an act of the legislature to construct a rail-way from the city of Schenectady to the village of Saratoga Springs, the capital stock

subscribed, and the work commenced. When completed, (which will probably be in from 12 to 18 months) a direct communication, by *steam*, will be opened from New-York to the Springs, a passage between which places, it is believed, will be effected in about 15 hours. With such a rapid, easy, elegant and safe facility, it can hardly be doubted that the number of strangers visiting the Springs will be greatly augmented, and that the period is not distant when these watering places, selected by the wealthy for a country residence, will become as populous and in all respects equal the most renowned and fashionable towns of the kind in Europe. The advantage, too, of a rail-road excursion, connected with the use of the waters, must prove of incalculable benefit to invalids, especially to the enfeebled, and will determine thousands, annually, in the selection of the Springs as the most favored spot for the recovery of health.]

GEOLOGICAL REMARKS

ON THE

COUNTY OF SARATOGA.

The arrangement of the different geological formations in this county is peculiarly interesting, and affords one of the happiest opportunities for acquiring a knowledge of the general outlines of the science of geology. The primitive transition and secondary formations present themselves almost at one view, and afford to the enquirer an opportunity for studying the physical characters, positions and arrangements with a facility that can scarcely be surpassed at any other spot. But before I proceed to a description of its geological structure, it will be necessary to say a few words on the geography of the county.

The county of Saratoga was set off from the county of Albany in the year 1791. It is situated between 42 deg. 46 min. and 43 deg. 23 min. north latitude, and 26 min. east and 10 min. west longitude, from the city of New-York, and is divided into twenty townships, the greater part of which

are highly cultivated, and all of them in a state of rapid improvement. The soil is generally good and well adapted to either pasturage or culture.

Formerly the great quantity of fine timber, which the land every where produced, its proximity to market, and the facilities afforded for erecting mills on never failing streams of water, induced the earlier settlers to turn their attention to the business of *lumbering*, to the almost entire neglect of the land. But the disappearance of the timber has now nearly put a stop to this kind of traffic, and the farmer is beginning to consult his better interest in the cultivation and improvement of his farm; and in a few more years this county will rank among the first in the state both for the quantity and quality of its productions.

The face of the country is undulating, and the soil considerably diversified in its character. Along the Hudson there are some tracts of alluvial bottoms extremely fertile; but it is remarkable that this river does not produce such extensive tracts of alluvial lands as are usually found along streams of its magnitude. Back from the river there are extensive tracts of *sandy soil* intermixed with a light loam. The soil of the mountainous districts is of a gravelly consistence, intermixed with much

vegetable substance, while that which occupies the space between the mountains and the sandy plains is generally of a rich vegetable mould.

The northern part of the county is mountainous. It consists of two elevated ridges, the first of which is styled the Palmertown mountains. It is a continuation or spur of the immense pile of primitive mountains which occupy the space between the waters of Lake Champlain and those of the St. Lawrence. They enter the county a few miles west of Glen's Falls, on the Hudson, in the town of Moreau, from whence this ridge, pursuing a southwesterly course, gradually sinks to the level of the plain lands in the vicinity of the mineral waters at Saratoga Springs. It presents an abrupt front, in many places precipitous, and rises in some parts to the height of several hundred feet above the level of the plains which lie to the east and south of it. From the top of this range the land gradually declines to the west for the distance of six or seven miles, when it is again abruptly thrown into another ridge called the Kayaderosseras mountains. This, like the Palmertown ridge, is a spur from the same group of primitive mountains to the north. It sinks to the general level of the country. In the town of Galway it presents an appearance very similar to that of the Palmertown mountains, and

like that declines gradually to the west until it comes in contact with another spur from the same source, called the Sacanadaga or Sacandaga mountains, which terminate at or near the Little Falls on the Mohawk; this range is in the county of Montgomery.

The waters of the Sacandaga river, one of the principal branches of the Hudson, have their source in this latter range of mountains, and collecting their scattered branches, they pursue an easterly course, and passing through the Kayaderosseras mountains unite with the Hudson. These waters now pursue a southerly course for a few miles only, when they again strike off to the east, and continuing the course, pass through the Palmertown mountains, and in the vicinity of Glen's Falls again take a southerly direction, and pursue it with but little variation to the city of New-York.

In the passage of these waters through the mountains, they form numerous rapids, cascades and cataracts, which present some of the most wild, romantic and picturesque scenery of which the country can boast.

These mountains comprise the primitive region in this county. The rock formations which com-

pose the regular constituent parts of these elevated ridges consist of the following :

Granite.
Sienite.
Gneiss.
Mica Slate.
Steatite.
Granular Lime Stone.

Granite

Discovers itself in a number of places along the whole extent of the Palmertown range. It rises to the top of some of the highest peaks of the mountain near where the Hudson crosses it, and is again met with in some of the vallies. At the southern termination of this mountainous range, in the immediate vicinity of the transition formation, and within a mile of the mineral waters at Saratoga Springs, there is an extensive mass of granite considerably elevated and lying across the course of the mountain nearly east and west. The surface of this range of granite is exposed for the distance of more than a mile, and it is the last of the primitive rocks which make their appearance in this direction until we reach the Highlands below Newburgh, a distance of more than one

hundred miles, where they again occur, and the appearance seems to justify the opinion that they constitute a part of the same range. Such is the situation of the valley or basin between these two distant points, that the Highlands may be distinctly seen over it, on a clear day, from almost any point on the last mentioned range of granite at Saratoga Springs.

On the west side of the mountain, where the land slopes off towards the Kayaderosseras, granite frequently presents itself in extensive ridges, sometimes exhibiting its own well defined surface, and sometimes supporting masses of sienite or gneiss, which run into each other ; and in this manner it likewise combines with mica slate, and although each rock is distinctly marked, yet they are so intimately combined at their union as to render it difficult to determine the exact line of their meeting.

On the Kayaderosseras mountains the granite discovers itself towards their southern termination and along their highest ridges. It is very conspicuous along the slope of the mountains on their western sides in the town of Providence. It likewise breaks through the gneiss, or rises above it in several places in the precipitous parts of the moun-

tains on their eastern aspect in the towns of Greenfield, Corinth and Hadley.

In the town of Concord, on the north side of the Sacandaga river, and not far from the road leading through the mountain along the valley of the river from Hadley to Edinburgh, there is an extensive range of beautiful flesh coloured granite. It rises through the gneiss which lies on both sides of it, and occupying a direction nearly southwest and northeast, may be traced a distance of some miles. It consists almost entirely of feldspar in a highly crystalline state, and contains some nodules of quartz and rarely some small specimens of mica.

Most of the granite which occurs in this region is of a coarse granular structure, having its usual constituents variously combined. Sometimes it consists almost entirely of feldspar and quartz. In some specimens the mica is in excess, and in others the mica and quartz are scarcely discoverable, and frequently all three are so intimately combined as to make it difficult to determine which is in excess.

Sometimes the granite occurs in veins passing through gneiss, in which case it is highly crystal-

line, and its constituent parts may be easily separated, often with a single blow of the hammer.

Gneiss.

This constitutes by far the greater proportion of the primitive rocks in this region. It composes almost the whole of the eastern face of the Palmertown mountains, except being occasionally interrupted by the granite. It extends to the west along the slope of those mountains to within a mile of the Kayaderosseras; and these last mountains are almost entirely composed of it. Where the Sacandaga river crosses this range, the mountains, which are several hundred feet in height, particularly on the north side, approach it in frightful precipices, which are entirely composed of this rock.

It is usually found resting on granite; but in some places it is observed to alternate with sienite, but more frequently with mica slate. It differs much in its composition; being in some instances composed almost entirely of mica and quartz, and in others of mica, quartz, feldspar and hornblend. Sometimes the feldspar is wanting altogether, and sometimes the mica is deficient. They are all in fine particles and much diffused in the mass.

Sienite, or Hornblend Rock,

Occurs in several places along the western declivity of the Palmertown mountains, and along the southern termination of the Kayaderosseras mountains in the town of Providence. It is observed in other places combined with gneiss or alternating with mica slate. It does not, however, appear to occupy a very extensive space in the formation of this region.

Mica Slate.

This rock occurs near and along the southern termination of the primitive region in the town of Greenfield. A little below Fitch's mills it forms a distinct stratification, and along the mountains to the north and northeast it rests on the gneiss, and is observed to form veins or seams in several places in the granite. It exhibits fragments of an extensive stratification both on the Palmertown and Kayaderosseras mountains.

Steatite, Soap-Stone, or Talcose Rock,

Occurs at or near the foot of the Palmertown mountains in the town of Moreau; it occurs likewise near the top of the mountain in the town of Corinth, and again in the town of Greenfield. They all appear to be of the same description, and evidently belong to the variety

termed pot-stone. The locality in Moreau appears to be extensive. It is covered by granular limestone, through a fissure of which, the specimens which I have were procured. I have several other specimens which I strongly suspect came from one of the above localities, although they were represented to me as coming from another quarter. They were procured by some infatuated *money diggers*, and were exhibited under a pretence or belief that they contained the precious metals.

Granular Limestone.

This occurs in the immediate vicinity of the foregoing formation, and appears to rest upon it. It enters largely into the formation of the Palmertown mountain at a place about two miles north from its southern termination. All which I have examined is of a coarse granular structure, and in its general character and appearance strongly resembles the Bennington and Shaftsbury marbles. It is easily worked, and when pure receives a fine polish. Most of the specimens, however, contain crystals of feldspar diffused throughout the mass in such abundance as to render it in a great measure unfit for the operations of the chissel. It is probable, nevertheless, that when those localities come to be properly explored, specimens

sufficiently pure may be procured for all the useful purposes to which marble is applied.

Every thing conspires to induce the belief that these primitive regions have undergone great and important changes since the period of their formation. Fragments of these rocks, exactly corresponding with those in place, are strewed in immense quantities all over the county in the form of sand, water-worn pebbles, rounded stones and bowlders, specimens of which, weighing many tons, are found at the distance of some miles from their parent rock resting on earth which covers secondary limestone.

The minerals which have been observed connected with the primitive formation of this region, are tourmaline, garnets, beryl, sulphuret of molybdena, graphite, spodumene, iron in the form of magnetic hematite and sulphuret, chrysoberyl,* prismatic and laminated mica, coccolite, &c.

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* This rare mineral occurs in veins of granite running through gneiss in two or three places, from which some beautiful specimens have been obtained.

TRANSITION FORMATION.

The rocks which are distinctly marked as belonging to this class in this region are—

Pudding Stone, or Conglomerate.
Quartzose, or Coarse Siliceous Sand Stone.
Metalliferous, or Mountain Lime Stone.
Argillaceous Slate.
Gray Wacke and Gray Wacke Slate.
Siliceous and Calcareous Sand Stone.

*Pudding Stone.**

This formation occurs in the town of Greenfield, not far from its south line, on the southeast side of the Kayaderosseras mountain, distinctly resting on the primitive rocks. It consists principally of rounded pebbles of quartz, from the size of a small shot to that of a man's head, and larger, united into one common mass by a kind of coarse ferruginous sand. The rounded masses which

* This formation, with the succeeding one, answers well to the description given by Eaton, of the millstone-grit of the canal district; but its situation here peremptorily forbids its being placed among the secondary rocks.

characterize this formation are much the largest at its commencement, or where it unites with the primitive rocks, and they regularly decrease in size as we climb up the series, until it passes into a uniform quartzose, or coarse siliceous sand stone, which overlays or alternates with it over a considerable extent of this part of the county. Broken rounded fragments of this formation are found all over the county, and in great abundance along the valley between the Palmertown and Kayaderosseras mountains.

Quartzose or Coarse Siliceous Sand Stone.

This formation occupies an extensive space along the valley between the Palmerton and Kayaderosseras mountains, and is found along the eastern declivity of the latter mountain, near its southern termination, in thin and horizontal strata, in some places alternating with conglomerate or passing into it. Near the foot of the mountain it inclines a little to the southeast, and disappears beneath more recent formations.

This formation is generally of a reddish brown color, particularly where the surface has been exposed to the weather. It is, however, frequently white or greyish white ; and at or near the falls on the Hudson at Hadley, it passes into and alter-

nates with a kind of rubblestone of a blueish cast, which slightly effervesces with acids, and sometimes contains calcareous spar.*

Metalliferous, or Mountain Lime Rock.

This formation occurs in the town of Greenfield, on an elevated ridge of land in the valley between the Palmertown and Kayaderosseras mountains, and evidently reposes on the foregoing sand stone. This locality is not very extensive, and I am not aware of its occurring at any other place, although it very probably may, along the course of the same valley which occupies the space between those primitive spurs for nearly twenty miles.

Argillaceous Slate.

This formation appears to underlay the greater part of the county that is not included in the primitive region. It forms the bed of the Hudson to a little above Baker's Falls, opposite Moreau, and

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* Professor Eaton has described this formation as being primitive, and mentions the occurrence of an intervening stratum of *pudding stone* as a remarkable circumstance. I once entertained the same opinion, but a more careful investigation has put it beyond a doubt that this is a *transition* formation, occupying the bottom of a basin formed by the surrounding primitive mountains.

that of the Mohawk to above Schenectady. It is likewise observable in the interior of the county, at the bottom and along the shores of the lakes, both at Saratoga and Ballston; and it forms the shores or banks of most of the streams that pass to the southward of the secondary formation, but it has not yet been observed to make its appearance between this last and the primitive rocks.

The layers of this rock are much curved, particularly along the southern parts of the county, and possess a considerable elevation to the northwest; but as it approaches towards the secondary rock, to the north, its layers become straight, are evidently less inclined, and separate into thin plates, some of which appear suitable for roof slate. The seams and fissures of these layers are frequently filled with calcareous spar; and at Baker's Falls large masses of this substance are imbedded in the rock. It is extremely liable to disintegration where the surface is exposed; and in many places it breaks into regular rhombick tables, whose fracture is always parallel to their sides, evincing a crystalline character.

Some specimens of this rock are glazed with black lead, which when handled soils the fingers; and from this circumstance, some inexperienced

geologists have mistaken it for bituminous shale, a substance which probably will not be found in this district.

Large masses of chlorite, milky quartz, and sometimes red jasper, are likewise found, either imbedded in this formation or passing through it in the form of veins ; and the sulphuret of iron, in beautiful golden colored crystals of various forms, occurs in great abundance, either in seams or imbedded in its substance. The decomposition of this latter substance probably gives origin to the *sulphurous waters* which are found in this region, and likewise to the efflorescence so often met with on the sides and walls of this rock. This efflorescence is either the sulphate of iron, lime or alumine, and sometimes consists of all three.

Siliceous slate appears to be imbedded in the argillite, rather than forming a separate stratum. It is of a black flint like appearance, possessing a concoidal fracture, and has a dark shining aspect. It occurs in large irregular masses in the argillaceous slate on the east side of Saratoga lake, and likewise along the southern parts of the county.

Gray-Wacke.

Wherever this rock is found in this region, it rests on the argillaceous slate, and in some places

is observed to alternate with it. It forms the summit of most of the insolated elevations throughout the southern parts of the county. It occupies a considerable space along the highlands which run parallel to the Hudson through the towns of Saratoga and Stillwater, and enters largely into the composition of Bemus' Heights. It is observable again along the southern parts of Ballston and Charlton, where it runs into, and alternates with gray-wacke slate. This last differs but little from the former, excepting it is more slaty in its structure. Along the east side of Saratoga Lake, and at several other places, they have a considerable declination to the southeast; but in Charlton their position is nearly horizontal. In some places the strata of this formation are curiously contorted and bent, furnishing interesting views for the speculations of the scientific geologist.

Siliceous and Calcareous Sand Stone.

These rocks occur all along the eastern and southern termination of the primitive region, with which in many places they appear to come nearly in contact. They appear in the banks of the Hudson a little below Glen's Falls, and they are very conspicuous along the south part of the town of Greenfield at the foot of the Kayaderosseras,

when they pursue the course of that primitive tract to its southern termination in the town of Galway. They then take a western course into the county of Montgomery. In Greenfield and Corinth this formation occupies a narrow space along the eastern foot of the Kayaderosseras mountain for the distance of several miles; and the same formation occurs again on its opposite side, along the foot of the Sacandaga mountains, and it is of this stone that the piers of the elegant state bridge over the Sacandaga river near the Fish House are constructed. Indeed, some of the rocks at this place approach very nearly to compact lime-stone, and contain organic remains.

Horn Stone is found in great abundance imbedded in the calcareous sand stone; and calcareous spar, beautifully crystallized and possessing a variety of colours, occurs in both. Some of these rocks contain in their fissures and cavities beautiful and very perfect six sided crystals of quartz. These occur in great abundance among the calcareous sand stones in the vicinity of the mineral springs at Saratoga, and are presented to the curious under the appellation of *diamonds*. Some small specimens of these crystals have been found in the loose earth about these rocks, having regular sides, with both terminations entire, and

possessing a brilliancy but little inferior to the diamond itself.

The siliceous sand stone in some places seems to pass into a kind of *amygdaloidal rock*, which effervesces but slightly with acids. Its cavities, which are numerous, are lined with chalcedony. This frequently occupies the whole space, but sometimes forms *geodes*, the insides of which are studded with small brilliant crystals of quartz, or a variety of crystallized spar. The walls of these *geodes* not unfrequently pass into *agate*, exhibiting its zigzag parallel lines very distinctly.

Most of the calcareous and siliceous sand stone of this region are easily wrought, and they bear the effects of a high temperature well; they are therefore used in Galway for the backs and jambs to chimneys. They have been likewise extensively quarried in Greenfield for the construction of the locks on the northern canal; and at Saratoga Springs they are used altogether for the foundations of buildings.

SECONDARY FORMATION.

The rocks which compose the regular series of this formation are—

Compact Lime-stone,
Shell Lime-stone, and
Oolite.

This lime-stone formation passes into the county at Glen's Falls, and pursuing a south westerly direction, occupies a narrow space along the course of the primitive region, and not far from it through the towns of Moreau, Wilton, Saratoga Springs, Milton, Galway, and so into the county of Montgomery.

The connection of this formation with the transition rocks is very obvious at a little distance below Glen's Falls, where it is first observed to alternate with calcareous and siliceous sand stone, and following the stream still further down, these last rocks alternate with gray-wacke and gray-wacke slate, which finally rest on the argillaceous slate, not far above Baker's Falls, in the town of Moreau.

Both the compact and shell lime-stone occur in the same series of strata, constituting distinct layers, which overlay each other at irregular intervals. They are of a dark blue colour, and the compact is susceptible of a fine polish, and is used for ornamental work of various kinds. Both, when properly burned, form a very pure lime, giving out when first heated, a strong sulphurous odour.

The shell lime-stone differs very materially from the compact, being more loose in its texture, and consisting nearly altogether of organic remains, the forms of which are perfect and entire ; among which have been recognized celleporites, pectenites, orthoceratites, amonites, cardites, gryphites, corallinites, terebratulites, ostryatites, and belemnites.

Oolite.

This formation had not been known as constituting a part of the regular series of rocks in the United States until it was discovered in this county. It occurs at a place about two miles north west from the village of Saratoga Springs, and within half a mile of the ridge of granite rocks which terminate the southernmost point of the Palmertown mountains. From this spot it stretches

across the valley which separates the Palmertown from the Kayaderosseras mountains, and probably may yet be traced around the termination of the latter mountains to those of the Sacandaga, and possibly along the whole extent of these primitive spurs of what professor Eaton has termed "the M'Comb Mountains."

The calcareous concretions which characterize and identify this formation, are for the most part arranged in successive layers throughout the strata in which they appear. They are globular, of the size of mustard seed, possess a shining black colour, and are evidently composed of concentric layers. They are united in the mass by a calcareous cement, more or less granular, combined with fine siliceous sand.

More than one half of the whole mass of some of the strata which constitute the series of this formation, consist of these globular concretions; in others they are more sparingly diffused, and some of the strata appear to be composed altogether of a calcareo-siliceous sand, without the intervention of a single globule. They are mostly of a dark gray colour, but they are in many places rendered brown by the intervention of ferruginous particles.

From a cursory examination, at the time this formation was first observed, I was induced to believe that it rested on the transition rocks ; but a more careful investigation has satisfied me that it rests on secondary or shell lime-stone. This lime-stone differs somewhat from that which I have before described ; it is of a lighter colour, less compact in its structure, the organic remains are more equally diffused throughout the strata, which are thinner, and are frequently separated by thin layers of aluminous slate, which, in some places, is nearly identified with the lime-stone. Can this be the *lias* of the European geologists ? and is this shale the *lias clay* which in England is known to be impregnated with muriate of soda and other salts ? and the same in which the mineral springs at Cheltenham and Gloucester are said to rise ? If it should be so, we shall find but little difficulty in accounting for the origin of some of the saline ingredients found in the mineral waters at Saratoga ; but it must be left to further investigation to determine this subject.

DILUVIAL AND ALLUVIAL FORMATIONS.

Diluvial and alluvial deposits cover a great proportion of the secondary and transition rocks throughout the county, in the form of thick beds of sand and clay and fragments of rocks more or less rounded by attrition.

The diluvial includes generally all those lands that are usually termed pine plains, extending from the northern to the southern limits of the county, forming a part of a range which follows the course of the Hudson for more than four hundred miles between the primitive mountains.

But little is as yet known of the depth or interior properties of this immense body of earth. It has seldom been opened to any extent but for the purposes of obtaining water, which is usually found at a depth of from ten to twenty-five feet, in a coarse loose sand resting on aluminous marl, or between this first stratum and another at no great distance beneath. When water is found to occur over the marl, it is usually very pure, combines readily with soap, and is what, in common language, is termed *soft ;* but when it occurs between the strata of marl, it possesses properties which

give it the appellation of *hard ;* it decomposes soap without forming a pure suds, and contains lime, magnesia, &c. usually combined with sulphuric or muriatic acid.

Wherever this formation has been exposed to any considerable depth, it presents a stratified structure consisting of regular and well defined strata of different coloured sand or earth, or coarse and fine gravel regularly arranged. Sometimes these strata are separated by thin layers of marl or clay, and sometimes by the argillaceous oxide of iron. They are horizontal, inclined or undulating at different places.

Marl appears to underlay or form a constituent part of almost the whole of the diluvial deposits of this county ; it is mostly argillaceous, but some specimens contain from forty to sixty per cent. of lime, and are evidently calcareous.

Argillaceous oxide of iron (bog ore) occurs in a number of places, imbeded in the sandy diluvial. On the plains between Saratoga and Ballston Spa, it was formerly found in sufficient quantities to supply a forge for a number of years, which produced from fifty to seventy tons of wrought or bar iron annually.

The alluvial formation is found along the banks of streams and at the bottoms of vallies ; it consists of beds of clay or marl, interrupted at intervals by layers of quicksand, and sometimes by that of vegetable remains.

Every thing in this extensive region of diluvial and alluvial deposits conspire to induce the belief that it once formed the bottom of an immense fresh water lake, which must have existed subsequent to the retiring of the oceanic waters, in which were deposited the lime and other secondary rocks which contain the remains of marine animals in such abundance ; but as the discussion of this subject is not necessarily connected with the object of the work before us, it is deemed inexpedient to pursue it any further at this time.

Having thus given a concise account of the discovery and settlement of the springs, and a general view of the geological features of the country in which they are situated, (preliminaries interesting and important,) I shall now proceed to an examination into the character and properties of the waters.

EXAMINATION

OF THE

MINERAL WATERS.

Such is the solvent power of water, that it is seldom, if ever, found perfectly pure or free from foreign ingredients. Rain and snow water, when collected in the open country, remote from towns or villages, and immediately after their descent, are the most pure of any used for domestic purposes; but even these are not entirely free from impurities.

The waters of springs, wells, rivers, lakes and ponds are still more impure, owing to their containing a larger proportion of foreign substances in solution or in a state of suspension; but it is seldom that these contain sufficient quantities to render them altogether unfit for domestic uses; when this does happen, they are styled MINERAL WATERS.

Mineral waters, are those which contain so large a proportion of foreign matter as to render them

unfit for culinary or other domestic uses. They possess a distinguishing flavor, and when taken into the stomach produce distinct medicinal effects. They have been, for the conveniency of description, divided into distinct classes, each class receiving an appropriate name from the prominent character given to the water by the articles held in solution. Hence we have

Acidulous waters, those which contain so large a proportion of carbonic acid as to give them a distinguishing character;

Chalybeate waters, containing iron in some of its soluble combinations;

Saline waters, those which contain one or more of the saline purging salts;

Sulphureous waters, those which contain sulphuretted hydrogen either in a combined or uncombined state.

It not unfrequently happens that the same fountain contains all the foregoing distinguishing ingredients, particularly the three first, in which case it is styled an ACIDULOUS SALINE CHALYBEATE

WATER. To this class belong the famous mineral waters of Saratoga.

These celebrated waters occur along the southern termination of the secondary, and in the immediate vicinity of the transition formation. They are scattered along a line running nearly east and west, for the distance of about twenty miles. At Ballston Spa there are a number of these springs, some of which make their appearance at the surface through alluvial deposits of plastic clay, or marl and sand, while others have been obtained by boring to a considerable depth in the transition slate which here forms the basis on which rests the alluvial deposits. Between this place and the village of Saratoga Springs there are several of these fountains of less note situated both in the transition and secondary formations. At Saratoga Springs they are more numerous, and diversified in their sensible qualities, than at any other place. They discover themselves, in great numbers, for the distance of more than a mile along the valley, in marl, which rests on secondary limestone. They occur again in the southeast part of the old town of Saratoga, at a place called the Quaker Springs. The rock formation at this place is transition slate.

All the waters of these numerous fountains appear to possess the same or nearly the same *qualities*, differing in their medicinal properties only, in the *quantities* of the articles which are held in solution.

I shall now proceed to a separate and distinct examination of all those fountains which have excited attention either from their notoriety, or their sensible qualities ; and I commence with the Congress Spring.

DESCRIPTION OF THE SPRINGS.

CONGRESS SPRING.

This truly celebrated fountain is situated on the west side of a narrow strip of low marshy ground, close to the foot of a beautiful little cascade, formed by a small limped stream which bursts from the earth but about fifty rods westerly from the spot. The spring was first discovered, as heretofore stated, during the summer of 1792.* At that time the water made its appearance through a small aperture in the side of a calcareous rock, whose margin formed the border of the brook. Here it was caught in tumblers as it issued from the rock in a small stream, and this formed the only resource for obtaining the water for several years after its discovery; but the quantity afforded was found altogether insufficient, even at that early period of its use, to satisfy the

* John Taylor Gillman, who has since been governor of the state of New-Hampshire, and a brother of his, were in company when this spring was first noticed, but it is not now certainly known which of the two first discovered it.

demands of its visitants ; it therefore became desirable to obtain a larger quantity, and with a view to effect this object, some efforts were made which unfortunately resulted in completely obstructing the passage of the water, and for a time the spring was supposed to be irretrievably lost.

Not long after this accident, Mr. Putnam, a gentleman whose name I have already had occasion to mention, who then resided near the spot, and who ranked among the most enterprizing of the early settlers, observed bubbles of gas breaking through the water in the middle of the brook, a few feet south and east from the site of the former fountain. Governed by the hope of being able to recover the original fountain, he turned the stream from its course, and having excavated the earth to the depth of about eight feet, discovered a strong mineral water rising in various places through a very hard and compact stratum of indurated marl imbedded with rounded pebbles and coarse gravel. He prepared a square tube made of strong plank, about ten inches in diameter, and of sufficient length to reach from the bottom of the excavation to a little above the surface ; this he placed upright in the well, and having adjusted the lower end so as to include a number of these separate little fountains, replaced the earth firmly around it, and

thus secured to posterity the possession of a mineral water which, for its peculiar medicinal properties, stands unrivalled.

In this curb, which is perfectly tight, the water rises to a few inches above the surface of the brook, which still passes close to the spring, and here it becomes stationary. A little below this point, however, it is suffered to escape through a small aperture made in the side of the curb for the purpose. At this aperture, when the spring is not disturbed, the water issues at the rate of something less than a gallon per minute. The quantity of water however which the fountain affords seems to be inexhaustible, for when the pressure has been removed by lessening the column of water in the curb, as when it has been rapidly dipped out, it rushes in with such rapidity that it becomes difficult, if not impossible, to remove the whole contents of the well.

PHYSICAL PROPERTIES OF THE WATER.

The surface of the well is constantly agitated by the escape of gas in fine bubbles, giving the appearance of simmering, not unlike that which water exhibits just before the process of violent ebullition takes place.

When first dipped, the water is remarkably limped and sparkling, and were it not for the constant escape of gas in innumerable fine points, it would be perfectly transparent. It however becomes turbid after standing a short time exposed to the air; a delicate white pellicle forms on its surface, which terminates in a reddish brown sediment. This sediment is likewise observable in the well, being incrustated on the walls of the curb and along the surface, over which the water makes its egress to the adjoining brook.

Transparent glasses and bottles which have been much used in the water, or in which the water has been suffered to stand for any length of time, become tarnished, and though carefully washed, retain a strong iridescent stain.

Its saline and gaseous properties are very perceptible to the palate, and to most persons not offensive. When swallowed, its effects depend in a great measure upon the state of the stomach at the time of receiving it, and upon the quantity drank. When taken, however, in a moderate draught, by a person in tolerable health, the sensation is seldom, if ever, unpleasant; and to those who are in the habitual use of it, particularly in the hot season, it is a delightful beverage.

Its most obvious effect, when taken into the stomach as a medicine, is that of an cathartic and diuretic. In most habits this effect is produced by drinking from four to six half pints in the morning before eating. Soon after taking it, the person feels a sense of fulness about the stomach and bowels, attended with frequent eructations of fixed air, a slight giddiness of the head, and a sensation bordering on a disposition to sleep. These feelings, however, are soon removed by the copious discharges that almost immediately follow, leaving the stomach with an increased appetite for food, and a disposition for exercise unattended with languor.

The respiration of all breathing animals is immediately affected by coming in close contact with the surface of this fountain. The gas which issues from it is immediately fatal to the lives of animals which happen to be immersed in it, and even fishes and frogs survive but a short time when placed in the water.

Flour, when made into a paste or dough with the water fresh from the spring, and immediately baked, forms a tolerably light bread while warm; but when cold, it becomes clammy and heavy like unleavened bread. The water is much used by

the country people for making "hot cakes." The flour is mixed with the water and a quantity of sour cream, and is ready for baking as soon as the ingredients are sufficiently kneeded together. It forms a very palatable hot cake, and recommends itself on account of the expedition with which it is prepared.

PRELIMINARY OBSERVATIONS.

The temperature of the water of this spring, as shown by Fahrenheit's thermometer when immersed in the bottom of the well, is 50 deg., and it does not appear to suffer any sensible variation either during the summer or winter months. At a time when the thermometer in the open air stood at 14 deg. below zero, and at another, when it was 90 deg. above, the water at the bottom of the well was still at 50 deg.

The specific gravity of the water at the temperature of 60 deg., the barometer ranging at 29.5 inches, is 1009.7, pure water being 1000. Excessive wet, or long seasons of dry weather, seem to produce a slight variation from this result; but repeated experiments, made at different periods and under various circumstances of season, &c. for the space of more than twenty years, have in no in-

stance produced a deviation of more than the 0.5 of a grain.

A thin, transparent glass flask was filled with the water fresh from the spring, a thermometer was immersed in it, and the whole placed in a sand bath, to which the heat was gradually applied.

At the temperature of 65 deg. there was a perceptible increase of air bubbles formed at the bottom of the flask, and passing up in rapid succession through the water.

At 80 deg. the water became much agitated by the rapid disengagement of the gas, and its transparency slightly affected by a faint milky appearance.

At 100 deg. the commotion in the water, from the abundant escape of gas, continued to increase as the temperature advanced, and the milkiness became more conspicuous.

At 150 deg. the profusion of air bubbles continued, and there appeared a very delicate white pellicle forming on the surface of the water, and the turbidness assumed a brownish shade.

At 180 deg. the air bubbles still continued to escape in great abundance, and the pellicle appeared broken and began to be deposited, together with a light flaky powder, which accumulated at the bottom of the flask.

At 200 degrees the water became less turbid, and the escape of gas had nearly ceased. It was then suffered to boil for the space of half an hour, and then removed from the sand bath ; and when cold, it became nearly clear and exhibited an abundance of a reddish brown sediment. It had lost its pungent acid flavor, but was decidedly more saline.

EXPERIMENTS WITH TESTS.

Exp. 1. Lime water, added in considerable quantity, produced a milky turbidness, which terminated in a pulverulent white precipitate. This effect is not produced on water that has been previously boiled.

Exp. 2. Tincture of litmus produced a light red colour, when added to water just dipped from the well. Litmus paper was likewise redened by plunging it into the water and retaining it there a few minutes ; the blue colour of the litmus paper

was, however, restored on exposing it for a few minutes to the air, or on drying it by the fire. The water, after being boiled, had no effect on the colour of litmus paper; but strips of this paper, reddened with distilled vinegar and then dipped into the water, had its blue colour restored.

Exp. 3. Tincture of red cabbage produced a beautiful green colour, and this was effected as readily after the water had been boiled as before; the effect, however, was best displayed on water that had been considerably concentrated by evaporation.

Exp. 4. Tincture of turmeric was converted into an orange colour when added to a quantity of the water, and when the water had been much concentrated by boiling, it was immediately converted into a brick red.

Exp. 5. Tincture of nutgalls, dropped into the water when taken recently from the spring, instantly produced a light purple tinge, which became much deeper after standing some time exposed to the air. No such effect was produced on water that had been previously boiled.

Exp. 6. Prussiate of potash produced a slight green tinge, which, after standing some time, became azure. This experiment succeeded best when the water had been previously saturated with sulphuric or muriatic acid; it then terminated in producing a precipitate of Prussian blue. On water that had been boiled, or suffered to stand for some time exposed to the air, the prussiate of potash had no sensible effect.

Exp. 7. Muriate of barytes, after standing some minutes mixed with the water fresh from the fountain, produced a slight cloudiness, which terminated in a white precipitate, which was entirely dissolved with effervescence in muriatic acid. When the water had been considerably concentrated, the precipitate was formed much more rapidly.

Exp. 8. Barytic water, when mixed with the water considerably concentrated by boiling, produced a white precipitate, which, like that in Exp. 7, was entirely dissolved with effervescence in muriatic acid.

Exp. 9. Oxalic acid produced an immediate active effervescence, which was succeeded by a dense white precipitate.

Exp. 10. Oxalate of ammonia produced an immediate turbidness, which terminated in a copious white precipitate ; when applied to water that had been boiled for some time, a slight change in its transparency only was produced.

Exp. 11. Carbonate of ammonia, when added in considerable quantities, produced a faint milky turbidness ; but, on the addition of the phosphate of soda, a copious white granular precipitate was immediately formed.

Exp. 12. Pure ammonia produced an immediate change in the transparency of the water, which was followed by a copious precipitate.

Exp. 13. Pure potash produced nearly the same effect.

Exp. 14. Sulphuric acid produced an instantaneous and very rapid effervescence, which resulted in an abundant white precipitate.

Exp. 15. Nitric and muriatic acid produced a similar disengagement of gas, but their effect was not followed by a precipitate of any kind.

Exp. 16. Nitrate of silver produced a thick cloud, which immediately collected into flakes and fell to the bottom of the vessel in great abundance. This effect was the same on water that had been boiled as on that which had not. The precipitate was of a white curdy appearance when first produced, but soon became of a dark muddy colour. This change of colour, however, did not take place when the vessel containing the mixture was kept excluded from the rays of light.

Exp. 17. Muriate of platina produced no effect, either on water fresh from the fountain, or on that which had been previously boiled; but by evaporating two gallons of the water by a slow heat, until cubic crystals began to form, filtering the remaining liquor and again evaporating until its bulk was much reduced by the crystallization of its saline ingredients, and then adding a small quantity of this test to the remaining solution, a very minute quantity of a bright yellow precipitate was produced.

Exp. 18. Chlorine gas. To a portion of the solution obtained from four gallons of water, in the manner related in the foregoing experiment, a quantity of chlorine gas was transmitted, which immediately converted the liquid into a reddish yellow colour. A small quantity of pure sulphuric

ether dissolved the coloring substance of the solution, becoming itself of a hyacinth red tint ; and this was again rendered colourless, by the addition of a drop or two of costic potash.

Exp. 19. A solution of starch was added to a portion of the water, containing the soluble salts, evaporated until crystallization commenced ; to this solution a few drops of dilute sulphuric acid was added, which gave to the whole solution a deep violet colour, which was destroyed by the introduction of a stream of chlorine.

INFERENCES,

Drawn from the foregoing observations and experiments.

1st. That this fountain has its source at a great depth in the earth, as is evinced from the regularity of its temperature at various and extreme states of the atmosphere, and from the circumstance of its being but slightly affected by wet and dry weather.

2d. That the water of this fountain retains its original properties, or its medicinal qualities, the same at least as they were twenty years ago, as is

evinced by the uniformity of its specific gravity during that period.

3d. That it contains a large proportion of a gaseous material in a free and in a combined state, as is made evident by the effects produced by the application of heat.

4th. That the gas so copiously evolved from the water is the carbonic acid or fixed air, as is inferred from Exp. 1 and 2.

5th. That the water contains a carbonated alkali, agreeably to Exp. 3 and 4.

6th. That oxide of iron forms one of the constituent properties of the water, and that it is held in solution by an excess of carbonic acid, agreeably to Exp. 5 and 6.

7th. That it does not contain sulphuric acid under any form or combination, as is evinced from the action of muriate of barytes and barytic water; the effect which these tests produce being referible to their union with a carbonated alkali. See Exp. 7 and 8.

8th. That it contains carbonate of lime in abundance, agreeably to Exp. 9 and 10.

9th. That it contains a large proportion of carbonate of magnesia, agreeably to Exp. 11.

10th. That the carbonates contained in the water form a large proportion of the ingredients held in solution, agreeably to Exp. 12, 13, 14 and 15.

11th. That it contains a large proportion of a muriatic salt, agreeably to Exp. 16.

12th. That the carbonated alkali, evinced by Exp. 3 and 4, is the carbonate of soda, as is made evident by Exp. 17. This experiment, likewise, indicates the presence of a minute quantity of the vegetable alkali or potassa.

13th. That the water contains the newly discovered elementary substance termed *brome* or *bromine*, is made abundantly evident by Exp. 18.

14th. That *iodine* forms another of the constituent properties of this interesting and truly distinguished water, is satisfactorily demonstrated by Exp. 19.

Thus, then, we have certain indications, as far as tests can be relied on, that the water of this fountain holds the following substances in solution, viz.

Carbonic Acid,	Muriatic Acid,
Soda,	Potassa or Potash,
Iron,	Bromine, and
Lime,	Iodine.
Magnesia,	

It remains to investigate the manner in which these substances are combined, and to determine the proportions in which they enter into the composition of the water.

EXAMINATION OF THE GASEOUS CONTENTS OF THE WATER.

A quantity of the gas was procured in the following manner: A large bladder was prepared, and to its mouth was secured a stopcock, to the end of which was fitted the small aperture of a large glass funnel. The funnel was inverted in the spring, and as soon as it became filled with gas, the stopcock attached to the bladder was applied, and the bladder, which was dry and had been previously emptied by rolling, was now suffered to fill

with the gas as it escaped from the water. In this way a sufficient quantity of the gas, for all the purposes of experimenting, may readily be obtained at any time.

A quantity of this gas was pressed from the bladder into a tumbler, in which was immersed a lighted taper, which was immediately extinguished.

A sprightly live mouse was confined in the bottom of a glass which was filled with the gas, and it expired in less than a minute.

It was emptied from one glass to another, and continued to occupy its station in the glasses for some minutes, evincing its presence by continuing to extinguish flame, &c.

A small quantity of the gas was pressed from the bladder into a glass vessel containing a quantity of pure transparent lime-water. It immediately became milky, and threw down a white precipitate, which dissolved in dilute muriatic acid with a strong effervescence.

Litmus paper, a little moistened and immersed in a glass containing the gas was immediately coloured red, but retained its florid colour no longer than it retained its moisture.

A quantity of the gas was passed up from the bladder into a graduated glass jar, filled with and inverted in a solution of caustic potash. A large proportion of the gas was almost immediately absorbed by the solution, while a very small quantity remained in the top of the jar apparently unaffected by it. Gas was continued to be added to the contents of the jar until its graduated sides indicated a quantity of ten inches, which remained and continued undissolved by the caustic solution. To test the properties of the remaining ten inches, a piece of phosphorus was secured to the end of a wire and passed up into the gas, and being brought close to the side of this jar, was ignited by the cautious application of a heated iron to the outside. It burned for a moment with its usual brilliancy, but soon became dim and went out. It was again lit, by the re-application of the hot iron, but was extinguished in the same breath, and could not again be rekindled, although it was slightly fused by the application of the iron. The gas in the jar was at first a little dilated, but after being cooled to its former temperature, it was found to have sustained a diminution of bulk to the amount of about two inches, or one fifth of the whole ; thus demonstrating that the gas, remaining unaffected by the operation of the solution of caustic potash, was pure atmospheric air.

From the results of these experiments, then, we are bound to infer that the gas which escapes in such profusion from this spring consists simply of the carbonic acid, with a small proportion of atmospheric air. To ascertain the proportions of each, and the amount contained in a given quantity of the water, the following method was adopted :

A tin bottle or jar, of the capacity of two quarts or 115.5 cubic inches, was procured, and its mouth secured and rendered perfectly tight by the application of a well adjusted stopcock ; to this was nicely fitted one end of a small flexible leaden tube, about two feet in length, at the other end of which was attached a capacious and well prepared bladder. This jar was filled with the water to be examined, at the spring, and the stopcock immediately applied and secured. It was then placed in a water bath, and the bladder connected with the flexible tube being previously well emptied, was suspended in a large glass vessel fitted for the purpose, and filled with pure water of the temperature of 60 deg. The tube having received a proper curvature, was connected with the stopcock. Heat was now applied to the bath in which the jar containing the water was placed, the valve of the cock opened, and the gas suffered to escape

through the tube into the bladder, which, as it dilated, forced the water in which it was suspended over into a glass jar prepared for its reception and gauged to half inches. It is obvious that the quantity of water remaining in the graduated jar at the end of the process would indicate very accurately the quantity of gas received in the bladder.

This apparatus for determining the quantity of gas contained in the water, aside from the mercurial trough, is unquestionably the best that could be adopted, and is in effect the same as that recommended by the late Sir Humphrey Davy in his analysis of soils. It however subjects the experiment to the probability of some trifling inaccuracies. It is obvious that the walls of the wet bladder may absorb a small proportion of the carbonic acid, and thereby render the quantity apparently less than what it really is ; and it is equally certain that the quantity of atmospheric air contained in the tube, together with the small quantity remaining in the bladder, (for it cannot be entirely excluded,) must add somewhat to the quantity obtained. The difference, however, in the result is too trifling to merit a serious consideration. The reception of the gas over mercury would unquestionably be attended with the greatest degree of accuracy ; but the difficulty of procuring a suffi-

cient quantity of that article in the country for the purpose of accurate experiments, entirely precluded the possibility of having recourse to that method.

With this apparatus, adjusted in the manner just described, two quarts or 115.5 cubic inches of the water of this spring afforded 159 inches of gas, at the temperature of 60 deg. and a pressure of the atmosphere, indicated by the mercury of the barometer, standing at 29.5 inch. Of this 159 inches, 155.5 were absorbed by a solution of caustic potash, leaving 3.5 inches on which the solution had no effect. The proportion of the two gases, then, contained in two quarts of the water, will stand thus :

	Inch.
Carbonic acid gas, ..	155.5
Atmospheric air,	3.5
Amount contained in 2 qts. of water,	159.5

It is rendered more than probable, from the result of repeated experiments, that the quantity of gas contained in a given quantity of the water is not always exactly the same. The variation, however, is never sufficient to produce any perceptible difference in the sensible qualities of the water, as it appears always to retain in combination considerably more than its bulk, besides a considerable

quantity of disengaged or free carbonic acid. The same quantity of water has afforded at different times, under exactly similar states of temperature and pressure of the atmosphere, 150, 156, 159, 164 and 170 cubic inches. From two quarts of the water that had been exposed in an open vessel for twenty-four hours, in a temperature of 60 degrees, was obtained 142 cubic inches of gas.

It would therefore appear that the difference in these results arises principally from the *free* carbonic acid diffused in the water, being in a greater or less quantity, and not from any deficiency or increase in that portion of the gas retained in it in a state of combination or solution.

The portion of free or uncombined gas must be considerably affected by the frequent and violent agitation of the water in the well, occasioned by the process of dipping it out for use, and in filling bottles for transportation; and to this circumstance may be imputed the variations alluded to. But it is not impossible that the quantity of the gas extricated from the interior of the earth, under various circumstances and at different times, should become more or less abundant.

EXAMINATION OF THE SOLID CONTENTS OF THE WATERS.

It has already been shown, by the application of tests, &c. that some of the solid ingredients which form a constituent part of the contents of the water, are in such minute quantities as to require the evaporation of a large portion in order to arrive at accurate results in estimating their quantities, while others enter so liberally into its composition as to be more readily and accurately determined by separating them from a much less quantity of the water. The following process was adopted :

A given quantity of the water was taken fresh from the spring and placed in a clean porcelain basin, and suffered to evaporate in a water bath heated by a small lamp, and kept at a temperature in no instance exceeding 160 deg. of Fahrenheit. The basin was secured from the intrusion of foreign substances by a cover of two or three folds of fine crape. In this manner it was suffered to dry gradually away, until cubic crystals began to form along the sides of the basin. It was then removed from the bath, and, while warm, thrown upon a filter, and the insoluble mass well washed with

hot recently distilled water, and then carefully removed from the filter into a glass basin, which was placed in a water bath, and its contents dried in a temperature of 212 deg. In this way the solid contents of the water were divided into two parts, soluble and insoluble.

Examination of the soluble parts.

Two separate parcels of the soluble salts or filtered solutions, each obtained from forty-five cubic inches of the water, were subjected to the following examination :

Parcel 1st was placed in a glass basin and evaporated in a water bath to dryness, at a low temperature. The remaining crystallized mass was finely pulverized in a glass mortar, and again dried at a temperature of 160 deg. for several hours. Over this dry saline residuum was poured a small quantity of alcohol, of the specific gravity of 0.815. After standing some time and being frequently agitated, the whole was thrown on a filter, and what remained on the paper, after being well washed by repeated applications of small quantities of alcohol, was again dried and numbered 1. The alcoholic solution was evaporated to dryness at a low temperature, and again digested in a much smaller quantity of alcohol, of the same specific

gravity as before. A few very minute cubic crystals remained undissolved by this last portion of the alcohol. They consisted of the muriate of soda, which had been taken up by the larger portion of the alcohol used in the first washing of the saline mass. They were transferred to No. 1. The alcoholic solution was again evaporated and dried, and weighed while warm something more than 0.7 of a grain. This was dissolved in a cold solution of starch, in a small test tube, and a drop or two of dilute sulphuric acid added. The whole immediately assumed a deep purple tinge, which, on standing some time, was precipitated with the starch, giving to it the well known characteristic blue colour afforded by the presence of IODINE. A few bubbles of chlorine gas were passed into the mixture. The blue colour faded immediately and disappeared.

An equal quantity of this salt, obtained from the same quantity of the water and in the same way, was dissolved in a fluid drachm of pure water, to which a drop or two of the muriate of platina was added. No indications of potash were manifested; the solution remained scarcely altered in its colour, and no precipitate appeared.

Iodine may exist in a mineral water in the state of an *iodic* or *hydriodic* acid, combined with either of the alkalies, potash or soda forming the iodate or hydriodate of the alkali with which they are united. The presence of potash is only indicated in the water by experimenting on large portions; it is not satisfactorily indicated even in the residuum of a gallon, and not at all in that obtained from forty-five cubic inches of the water, as has just been shown. It follows, therefore, that soda is the alkaline base which retains the acid in question, forming the iodate or hydriodate of soda.

It has already been shown that alcohol dissolves the whole of the substance which discovers the presence of iodine; and as iodate of soda is not soluble in that menstrum, we are bound to infer that the salt in question is the *hydriodate* of soda.

The inconsiderableness of this salt afforded by the above quantity of the water not admitting of all the accuracy desirable in estimating the quantity of so important an article, recourse was had to another process; the dry soluble salts obtained from two gallons, or 462 cubic inches of the water, was submitted to the action of alcohol with the same precaution as before related, and from this quantity was obtained a trifle over 7 grains. It

exhibited all the characteristic properties of the hydriodate of soda already noticed, and in addition afforded evidences of containing a trace of bromine and potash: substances, the character and properties of which will be investigated in another paragraph.

This seven grains of the hydriodate of soda, together with several other smaller parcels of the same salt obtained at different times from different quantities of the water, were together placed in a Florence flask and dissolved in an ounce or two of pure water; the flask was placed over a spirit lamp, and as its contents became hot, a few drops of sulphuric acid were added to the solution, when the well known *purple fumes* of iodine appeared very conspicuous at the neck of the flask, furnishing the most incontestible evidence of the presence of that substance.

Having thus finished the investigation relating to the presence and quantity of iodine, the further separation of the soluble salts was resumed. The mass numbered 1 of parcel I, which remained after the action of the alcohol, was dissolved in an ounce of pure water, and dilute acetic acid added in small quantities at a time as long as any effervescence was produced. The whole was then dried

at a low temperature, and again digested in alcohol of the same specific gravity as before ; it was filtered, and the filtered solution evaporated, and a quantity of acetate of soda procured. This was subjected to a low red heat, in a platina capsule, the acetic acid was thus expelled, and the sub-carbonate of soda remained, weighing 1.25 grains, equivalent to 1.75 grains of the bi-carbonate ; in which state it probably enters into the composition of the water.

The remaining saline substance was dissolved in a quantity of pure water, in a suitable precipitating glass, and to the clear solution was added a solution of the nitrate of silver ; it was added in small quantities at a time, as long as any turbidness was produced. It was then filtered, washed with repeated portions of distilled water, and the precipitate carefully dried ; it afforded 182.5 grains of chloride of silver, equivalent to 75 grains of the chloride of sodium, or sea salt.

In order to test the accuracy of the foregoing results, parcel II, which had been reserved for this purpose, was evaporated, its contents dried and digested in alcohol, with the same precautions as parcel I, and exactly the same quantity of hydriadate of soda obtained. The remaining salts were

dissolved in two ounces of pure water, and a solution of muriate of barytes added in small portions, as long as any precipitate or discoloration was produced. The precipitate was now obtained on a filter, washed with pure water, and carefully dried; it weighed 2.3 grains. It dissolved entire in dilute muriatic acid with effervescence, and was rendered insoluble in water by the addition of sulphuric acid. It was therefore the carbonate of barytes, the muriate of which had been decomposed; the muriatic acid of the barytes had united to the soda, forming muriate of soda, while the carbonic acid of the soda had united to the divorced barytes, forming the insoluble salt, carbonate of barytes, 2.3 grains of which is equivalent to 1.25 grains of the sub-carbonate of soda, or 1.75 of the bi-carbonate, as near as weights and scales can be supposed to make it.

This result, corresponding so nearly with the other, might give to this mode of separating the carbonate of soda from the muriate the preference, provided the carbonate of magnesia be present; the muriate of barytes is not decomposed by that substance, but will remain in solution with the muriate of soda when the carbonate of soda is all decomposed. The magnesia may then be converted into a muriate by the addition of dilute

muriatic acid, the whole dried, and the muriate of magnesia taken up by alcohol. This process was adopted in the present instance, but no muriate of magnesia was procured. It is to be presumed therefore that the carbonate of magnesia is not held in solution with the soluble salts, at least not in sufficient quantity to be appreciated.

The discovery of iodine and bromine in some of the mineral springs of Europe led to the conjecture that they might be found to enter into the composition of the waters of Saratoga, and this conjecture was strengthened by the knowledge of their great efficacy in the cure of a variety of strumus affections, for which their known properties did not very satisfactorily account.

Iodine was first detected in these waters in the fall of 1828, and announced in 1829, in the American Journal of Science; and Mr. A. A. Hayes, of New-Haven, detected bromine and potash, and announced the discovery in the same Journal in July, 1830.

The spare quantity afforded by the water of the two last substances, makes it necessary to operate on a large portion in order to obtain decisive evidence of their presence. Mr. Hayes says

that he obtained the knowledge of the fact from "a portion of the dry saline matter left after evaporating a *large quantity* of the water." It has already been shown that their existence in a gallon of the water is at least equivocal.

With a view to corroborate the result of the experiments already noticed, the saline residuum of four gallons, or 924 cubic inches of the water was procured, effused in distilled water, filtered, and the filtered solution evaporated by a slow process, until a large portion of the muriate of soda had crystallized; the remaining liquor was treated with chlorine gas, and then agitated with a portion of pure sulphuric ether. On the addition of chlorine the liquid assumed an orange yellow colour, which was all taken up by the ether, which then became of a hyacinth or reddish brown tint, arose to the surface, and formed a perfect line of distinction in the liquid contents of the glass; the etherial solution was removed by means of a glass syringe, and a drop or two of a solution of caustic potash added to it, it immediatcly became colourless, and on suffering the solution to evaporate in a low temperature, a few minute cubic crystals of the hydro-bromate of potash were deposited.

Another portion of the salts produced from four gallons of the water was obtained and prepared as above by concentrating the solution of the soluble salts, until nearly all the muriate of soda was crystallized. To the clear yellowish coloured liquor which remained was added a few drops of the muriate of platina. It produced an immediate fine yellow coloured precipitate, indicating the presence of a small quantity of potash.

These experiments fully establish the existence of *bromine* in this water. It is in the state of the hydro-bromic acid united to potash, forming the hydro-bromate of potash; its quantity, however, is extremely small, and can only be accurately determined by more extensive and labored operations.

Examination of the Insoluble parts.

Having thus separated and determined the quantities of the various ingredients soluble in pure water, the saline mass remaining on the filter, after the action of that fluid, was next submitted to examination.

The whole quantity of this substance obtained from 45 cubic inches of the water was placed in a Florence flask, and dilute nitric acid poured over

it as long as any effervescence was produced, the acid was then added in slight excess, and the flask placed over a spirit lamp, and its contents suffered to boil for half an hour; it was then removed from the stand, and when cold, a minute quantity of a grayish white powder was observed in the bottom of the flask, which remained undissolved by the operation of the dilute acid; this was separated from the clear solution on a filter, and after being well washed with distilled water, was dried at a low red heat in a platina crucible. It produced a whitish coloured powder, of a rough dry feeling when rubbed between the fingers, and when fused with a little carbonate of soda produced a greenish coloured glass. It was therefore pure silix. It weighed as near as could be ascertained 0.25 grains.

The filtered solution was then placed in a precipitating glass, and a small quantity of a solution of pure ammonia added; it produced a brownish coloured cloud in the clear solution, which, after adding a sufficient quantity of the ammonia, subsided to the bottom of the flask in the form of a brown sediment. This was removed by filtering, and, being well washed, was dried and brought to a red heat in a platina crucible, and was then again dissolved in dilute nitric acid, and again pre-

cipitated by ammonia, filtered, and the filtered solution added to that of the previous process. What remained on the filter was dried again at a red heat, and was the pure red or per-oxide of iron, and weighed about 0.75 of a grain. The quantity, however, of this, as well as that of the silix, will, for the sake of greater accuracy, be determined from a larger portion of the water.

After thus separating the silix and iron, the remaining solution, consisting of the nitrate of lime and magnesia, was transferred to a porcelain evaporating basin, and suffered to evaporate over a moderate heat until crystals began to appear. The nitrate was then converted into a sulphate, by adding dilute sulphuric acid in excess, and evaporating the new compound nearly to dryness. The residuum was then transferred to a platina crucible, and gradually brought to a low red heat. What remained consisted purely of sulphate of lime and magnesia, and weighed, while warm, 41.5 grains. To separate these two salts, a saturated solution of sulphate of lime in distilled water was used; it dissolved the sulphate of magnesia, which was filtered from the remaining insoluble sulphate of lime, and this last was again dried at a low red heat, and weighed while warm 24 grains, equivalent to 19.11 grains of the carbonate of lime.

The sulphate of lime in solution with the sulphate of magnesia was separated by the oxalate of ammonia, carefully added, the solution filtered, evaporated, and the residual salt brought to a red heat, and weighed while warm exactly 17.5 grains. It was the sulphate of magnesia, equivalent to 12.25 grains of the carbonate of magnesia, or 18.66 grains of the bi-carbonate.

To determine with more precision the actual quantity of iron, one gallon of the water was evaporated, and the insoluble part of its residuum obtained by filtering, dissolved in dilute nitric acid, and boiled for the space of half an hour in a Florence flask. The silix which remained undissolved by the acid in the flask was separated, and, after being subjected to a red heat, weighed while warm 1.5 grains. The iron was then precipitated by the addition of a solution of pure ammonia, as before described, dried at a red heat, and then redissolved in dilute nitric acid, to free it from any impurities which might have been precipitated along with it by the action of the caustic ammonia in the first operation. It was again precipitated in the same way, dried at a red heat in a platina crucible, and weighed while warm 3.5 grains. It was the red, or per-oxide of iron, equivalent to 5.075 grains of the carbonate of iron.

RECAPITULATION.

From the foregoing experiments and deductions, one gallon, or 231 cubic inches, of the water of the Congress Spring contains the following substances, viz.

Chloride of Sodium, (sea salt)	385.0	
Hydriodate of Soda,	3.5	
Bi-carbonate of Soda,	8.982	
Bi-carbonate of Magnesia,	95.788	
Carbonate of Lime,	98.098	
Carbonate of Iron,	5.075	
Silix,	1.5	
Hydro-bromate of Potash, a trace.		
		597.943 grs.
Carbonic acid gas,	311	
Atmospheric air,	7	
Gaseous contents,	318	cubic inches.

Water, at the usual temperature and pressure of the atmosphere, can only dissolve its own bulk of carbonic acid. As this water contains nearly one third more than that quantity, it becomes a subject of some interest to ascertain by what means it acquires so large a proportion of this gas.

It is well known that the sub-carbonates of soda and magnesia, when dissolved in water saturated with carbonic acid, receive an additional portion of the acid, and become bi-carbonates. These bi-carbonates are however decomposed by the application of heat, and at the temperature of boiling water, or 212°, they part with the additional portion of the acid, and become again sub-carbonates, in which state these salts are obtained from the water after boiling. The quantity of carbonic acid given off in this way by the bi-carbonates of soda and magnesia passing into sub-carbonates, will account very satisfactorily for the quantity obtained from the water over and above its bulk.

It will be observed that the quantity of carbonic acid obtained from one gallon exceeds its bulk by 80 cubic inches, which, allowing 100 cubic inches to weigh 46.57 grains, will amount to 37.25 grains; and the additional portion of carbonic acid taken up by the quantity of soda and magnesia found in the water, in order to constitute the bi-carbonates, will amount to about 35.5 grains, a correspondence sufficiently accurate to justify the position here taken.

This water has been repeatedly analyzed by a number of professed chemists; but the results of

their examinations have been so discordant as to afford but little confidence in their correctness. These results, however, do not differ so much in the *variety* of the articles produced, as in the *quantities* of those acknowledged to be present. Much of this difference may be imputed to the various methods adopted to separate the constituent properties, and to the different states in which these properties are produced; some of them being in a state of crystallization containing a large portion of water, while the same article is obtained under another process in a perfectly dry state, producing an essential difference in the apparent quantity. But the greatest cause of the discordant results is the transportation of the water from the spring. It is usually bottled, perhaps imperfectly corked, transported to a considerable distance, and then suffered to stand in a quiescent state, subjected to a variety of temperature, until the convenience of the chemist affords an opportunity for its examination. In this way it must necessarily part with a large share of its carbonic acid, and the substances held in solution by it are of course precipitated. Hence no iron, or but equivocal traces of it, are obtained from the water thus procured; while at the fountain, its presence is clearly demonstrated by the most simple experiments: indeed, the mere deposit from the water, as it passes from the spring, affords

incontestible evidence of its presence. It is therefore abundantly evident, that in order to obtain any thing like an accurate knowledge of the properties and proportions of the various salts which enter into the composition of this water, the analysis should be conducted on the spot.

The late Professor Dana suggested the idea, that some of the substances obtained from the water by analysis, might be the product of the operation, and not an original ingredient; and added, that "carbonate of soda and muriate of magnesia might exist in solution together in this dilute state, without their mutual affinities being exerted; but when the solution was concentrated, carbonate of magnesia and muriate of soda would be formed;" and he therefore inferred, that instead of the *muriate* of soda and *carbonate* of magnesia, as procured from a quantity of this water, the basis of these two salts actually existed in the water in the state of the *muriate of magnesia* and *carbonate of soda.*

This subject has been subsequently investigated by Dr. Murray. He alleges, from numerous experiments, that from evaporating the solvent, he procured salts different from those known to be in the solution. This induced him to call in question the usual modes of analysis; and he proposed anoth-

er method of determining the state of combination of the ingredients obtained from mineral waters, founded upon the principle that the force of affinity is much influenced by the operation of external circumstances; and that when these occur, compounds may be formed different from those which owe their origin to the pure force of affinity. Professor Brande, however, of the royal institution of London, will not admit the existence of incompatible salts to the extent which Dr. Murray's principle requires.

Be this as it may, facts do not warrant the belief that the operation of the principle, if established, is exerted in the formation of any of the salts contained in this water. If a part of the muriatic acid, which goes to form the muriate of soda in the concentrated solution, is really united to the magnesia or lime while in a more dilute state, it follows of course, that the quantity of the carbonate of soda at the same time must be considerably increased; but this does not appear to be the fact. The application of appropriate tests to the water fresh from the spring, indicate but faintly the presence of a carbonated alkali; but as the water is concentrated, the existence of this article becomes more and more apparent; whereas, directly the

reverse of this would be the case, if the suggestion of Professor Dana was correct. It is therefore more than probable that the substances obtained are actually those which enter into the composition of the water, and constitute its active medicinal properties.

MEDICAL HISTORY.

The medicinal qualities of this spring have acquired for it a reputation abroad to which no other fountain in the United States has yet attained; and it is highly probable, from the active ingredients which enter into its composition, that it will continue to retain an ascendency which has been so liberally and so justly conferred upon it. Such are its rare and peculiar qualities, that while it operates as an active and efficient medicine, it possesses the properties of an agreeable and delightful beverage; and it is daily sought after and drank by all classes of people, for no other purpose than simply to gratify the palate or to allay the thirst. And although in this way it is frequently taken in sufficient quantities to produce its most active effects upon the bowels, it is seldom, if ever, known to be attended with any unpleasant consequences, but is always considered by those who thus use it as invigorating and healthy.

From one to three pints of the water, taken in the morning before eating, usually operates freely as a cathartic, and at the same time has a most powerful effect in increasing the ordinary secretions of the kidneys; but its operation, like that of all other medicines, is much influenced by the condition of the stomach and bowels at the time of receiving it, as well as by the state of the system generally. It therefore frequently happens that a much larger quantity seems to be required, in order to produce its characteristic effect upon the bowels; and invalids have been known to drink twenty, thirty and even forty tumblers full of it in a morning without much apparent inconvenience. It requires, however, but a slight acquaintance with the properties of the water, to satisfy any rational mind, that such a procedure is highly improper and even dangerous. Quantities so immoderate can never be useful to persons who are either infirm or in health; and there are numerous instances in which they have produced consequences of a very alarming character.

It is a cathartic, possessing evidently interesting and important qualities, and as such it is recommended and used in all those chronic diseases where cathartics and gentle aperients are indicated; and such are its peculiar effects, when judi-

ciously administered, that it may be persevered in for almost any length of time, and a daily increased evacuation from the bowels produced without debilitating the alimentary canal, or in any way impairing the digestive powers of the stomach; but on the contrary, the spirits, appetite and general health will be improved and invigorated.

It is obvious that the mode and management of taking the water must depend altogether upon the nature of the case for which it is administered, and the consequent kind of effect desired to be produced from it. As it is directed simply for its cathartic or aperient properties, it is in almost all cases important that its operation should be speedily and promptly effected. The quantity required to produce the effect desired must be varied with different persons; and even the same persons at different times, and under different circumstances, will require different portions. It is therefore impossible to fix upon any certain quantity that will apply in all cases: much must be left to the judgment and discretion of the invalid himself. In ordinary cases, *three* pints taken on an empty stomach, an hour or two before eating, and followed by a proper share of exercise, will be found amply sufficient for all the purposes required. Should this quantity however be found inadequate to the

effect, it will be better to relinquish the use of it altogether for the day, than to attempt to produce a different result by additional potations of the water. On the following morning the quantity may be increased to another pint; and should there be fears of the inadequacy of this quantity from extreme constipation of the bowels or other causes, a tea-spoonful or two of epsom salts may be added to the first tumbler. This will insure a competent operation, and the invalid will soon be enabled by his experience to determine the quantity which his case requires.

In cases where the stomach and bowels have been for a long time subjected to the effect of morbid excitement, and the whole system enervated by the deranged functions of the assimilating organs, the quantity here recommended will be altogether inadmissible. The effects of distention, and the abstraction of temperature consequent upon admitting so large a quantity of cold water into a stomach thus enfeebled, can scarcely fail of being highly detrimental. Reliance therefore must not be placed upon the water, in these cases, to move the bowels; it can only be used as an auxiliary to that purpose, and should always be associated with some other cathartic medicine suited to the particular case. A little magnesia, magnesia

and rheubarb or a laxative pill may be taken over night, and a tea-spoon or two full of the sulphate of potass or magnesia, combined with a glass or two of the water in the morning, is usually advised.

The proper time for drinking the water of this spring is unquestionably in the morning—an hour or two before breakfast; indeed, as a general rule, it should not be meddled with at any other period of the day; and it would be much better for those whose complaints render them fit subjects for its administration, if the fountain should be locked up and no one suffered to approach it after the hour of nine or ten in the morning.

Nothing can be more absurd than the ridiculous practice of taking large potations of this water at all hours of the day, and particularly, immediately after meals. The impropriety of evacuating the contents of the stomach and bowels before the assimilating powers of digestion have accomplished their labors, must be obvious to every one. It should therefore only be taken in the morning before eating, when its operation will be exerted in removing the fetid remnants of an impaired digestion, and evacuating the sordid and irritating accumulations induced by an enfeebled state of the intestinal canal. When this effect is produced,

the water has accomplished all that can reasonably be expected from its use; and the digestive organs being freed from their offensive feculent burthen, are left in a condition to act with better effect on the subsequent aliment which may be presented to them.

The invalid, whose health and strength will admit of it, should always rise as early as six o'clock at farthest, and when the weather is suitable, repair to the spring, and take the water at the fountain head. The exercise necessarily connected with this mode of drinking the water, together with the invigorating effect of a wholesome atmosphere and amusing company, add much to its efficacy as a medicine.

The manner of drinking the water at the fountain requires but little attention. It is dipped from the spring in half pint tumblers, one of which constitutes a very suitable quantity for a single draught. As it is intended to move the bowels, it is necessary that these draughts should be repeated in as quick succession as the condition of the stomach will permit. As soon as the sense of fullness occasioned by the first tumbler has passed off, another may be taken, and so on until the quantity necessary to move the bowels has all

been drank. This is usually accomplished in the course of half an hour, without materially disturbing the tranquility of the stomach, and its effect is seldom delayed beyond the limits of an hour. Should this be the case, however, and no operation effected before the period of breakfeast arrives, a cup of coffee or tea, connected with a light repast and suitable exercise, will seldom fail of producing a speedy termination to the delay.

The low temperature of the water, in some cases, forms a serious objection to its being drank to the extent that is required. This may be remedied in some measure by securing the water in well corked bottles, and suffering them to stand in the room over night. In this situation the temperature of the water is elevated to that of the atmosphere of the room, and may be drank with less danger of producing chills. When these do succeed, after the above precaution, recourse is sometimes had to plunging the bottle into warm water a few times before removing the cork. This will unquestionably remedy the evil; but the water will be more apt to produce nausea and other unpleasant disturbances of the stomach, not less injurious to the good effect to be expected from its use than that of chills.

It should always be remembered, that by elevating the temperature of the water to any extent, the escape of its carbonic acid becomes abundant, and it is thereby deprived of one of its most important ingredients, the loss of which renders it extremely insipid, and its effects are by no means so pleasant or useful.

The property of this fountain has, within a few years, passed from the heirs of the late Henry and John Livingston into the hands of John Clarke and Thomas Lynch of New-York, who are now the sole proprietors and owners of it. These gentlemen have made it an object of their special care and attention, and it is to their liberality that the public are indebted for the convenient and cleanly manner in which the water is presented to them at the well, and for the improvements that have been made and are still making in its immediate vicinity. They are likewise entitled to great credit for the care and attention which they bestow in putting up the water and preparing it for transportation. They are now the only persons through whom it can be procured ;* and such has been the

* Messrs. Lynch and Clarke have reserved to themselves the exclusive right of bottling and vending the water, and the public may rely upon receiving it from them in as perfect a state as it is capable of retaining when bottled.

success of their exertions, and the public estimation of its value, that it has been introduced into almost every part of the world. There is scarcely a town in the United States of any magnitude that is not supplied with it, nor a vessel destined to any distant port that does not enumerate the *Congress water* in the list of her sea stores or her freight.

The water loses much of its pungency and agreeable flavor from being bottled, and its iron is entirely deposited. It however retains its aperient properties in tolerable perfection, and if properly secured and kept in a quiescent state and even temperature, may be preserved to any length of time.

The practice of putting the water into wooden casks, earthen jugs, or tin canisters, for the purpose of transportation, as is sometimes done, is but little better than placing it in open vessels. It soon loses its vivifying gas, and becomes extremely insipid and offensive. It can only be properly secured and preserved in strong glass bottles, well corked, and the corks fastened by wiring.

From the known and acknowledged efficacy of the water as a medicine, it was inferred that its sa-

line deposits might answer a valuable purpose in cases where the water could not be procured, and at one time considerable quantities were manufactured for sale, by evaporation ; but the imperfect solubility of these salts renders them not only disagreeable, but frequently irritating and offensive to the stomach, and the present proprietors of the spring have very properly prohibited their further manufacture.

Influenced by the popular character of the water, individuals have been induced to attempt an artificial composition of it, and, under the imposing names of "Congress Water" and "Saratoga Powders," articles have been presented to the public which, although they possess aperient qualities, in reality bear no resemblance, either in their effects or their properties, to the mineral water, the name of which they have assumed. They may move the bowels, it is true, but in this they do not appear to possess any superiority over the common Seidlitz powder, which is now in every body's hands, and which, as a laxative medicine, in all ordinary cases, is undoubtedly to be preferred.

COLUMBIAN SPRING.

This fountain is situated on the south side of the brook, about fifteen or twenty rods directly southwest from the Congress. It discovers itself at the foot of a steep bank, consisting of loose sand and yellow loam.

The water being confined by a wooden curb, rises a few inches above the surface of the surrounding earth, and escapes through a small hole in the side of the curb, made for the purpose.

The well is sunk in the earth about six feet, and such is the supply of water, that it is difficult to remove it as fast as it accumulates, even with a bucket.

The surface of the water, when viewed in the fountain, does not present the simmering appearance so conspicuous in the Congress; but the gas breaks up through it in much larger bubbles, at irregular intervals, giving to the water the resemblance of a more violent ebullition.

The surface of the earth over which the water escapes, and the inside of the troughs which conduct it away, as well as the inside of the curb, are covered with a thick ferruginous crust of a deep brown colour.

The water itself is quite limpid, and when drank, betrays a strong chalybeate taste, and a pungency indicative of the presence of a large portion of carbonic acid. In its physical properties generally, this water resembles the Congress in all respects, excepting its saline impregnation, which is evidently much less.

Its temperature at the bottom of the well is uniformly at 50 deg., and its specific gravity at the temperature of 60 deg. The barometer, standing at 29.5 inches, is 1007.3, pure water being 1000.

The application of chemical tests to the water of this fountain indicates nothing to distinguish it from that of the Congress, the same ingredients being clearly distinguished in both. They differ, however, in the quantities of the articles which they respectively hold in solution, as is shown by the specific gravity of the two, as well as by the greater or less effect produced by the application of reagents. Indeed, in this respect there is a very perceptible difference indicated by the taste alone.

By pursuing a process similar to that related in the analysis of the Congress water, one gallon, or 231 cubic inches, of this water yielded the following ingredients, viz.

Chloride of Sodium,	267.
Bi-carbonate of Soda,	15.4
Bi-carbonate of Magnesia,	46.71
Hydriodate of Soda,	2.56
Carbonate of Lime,	68.
Carbonate of Iron,	5.58
Silix,	2.05
Hydro-bromate of Potash, scarcely a trace.	
Solid contents in a gallon,	407.3 gr.
Carbonic acid gas,	272.06
Atmospheric air,	4.5
Gaseous contents in a gallon,	276.56 inch.

This spring has been materially improved, by clearing out the well and securing it against the intrusion of fresh water, by means of a tight curb inserted to its bottom.

The water seldom operates as a cathartic, unless when taken in large quantities, or used by persons

whose stomachs are extremely irritable. Its most obvious effects, when taken in proper doses, are diuretic, at the same time operating on the secretions and excretions generally. It likewise manifests the powers of a mild and pleasant stimulant; and from the large proportion of iron which enters into its composition, it occupies a distinguished rank among the *tonic* waters which the place affords.

WASHINGTON SPRING.

Pursuing a south-west direction from the Columbian Spring about fifty rods, we come to the Washington Spring, situated by the side of a rill of very pure water, which has its origin from the banks of sand at no great distance. The fountain is situated on ground considerably elevated above any of the others. It makes its appearance at the surface through a bed of argillaceous marl of a deep blue colour. The water, nevertheless, is remarkably limpid, and has been recently much improved, in all its sensible properties, by sinking the well to a much greater depth, and securing it by a tight wooden curb.

It is a sparkling acidulous water. Its temperature is 50 deg., and its specific gravity, at the temperature of 60 deg. under the ordinary pressure of the atmosphere, is 1007.8, and one gallon of it affords the following articles, viz.

Chloride of Sodium,	grs. 281.5
Bi-carbonate of Soda,	16.5
Bi-carbonate of Magnesia,	40.92
Carbonate of Lime,	92.6

Carbonate of Iron,	3.25
Silix,	1.5
Hydriodate of Soda,	2.75
Solid contents in a gallon,	grs. 439.02
Carbonic acid gas,	262.5
Atmospheric air,	6.8
Gaseous contents in a gallon,	269.3 inch.

This fountain was resorted to formerly, on account of its retired situation, (it being then in a forest,) for the purpose of bathing ulcerated limbs and eruptive diseases of the body, for the cure of which it became quite distinguished. From this hint a large and commodious bath-house has lately been erected close to the spring, called the Washington Bath, which is supplied with mineral water from this spring. It has likewise the advantage of the very pure stream of fresh water which passes immediately under the building, for the purpose of ordinary bathing.

Near to this spring Mr. Munger has lately erected a small fish-pond, which is abundantly supplied with pure water from the neighboring sand banks. It contains at present some thousands of speck-

led trout, which seem to have lost much of their native shyness by being thus domesticated. They come to the surface in crowds, and devour with avidity whatever is thrown in for their sustenance; and they may be seen at all times basking in the shade, or darting along the bottom in pursuit of prey. With this pond is enclosed about an acre of ground, a part of which is tastefully laid out into walks; and on the margin of the little pool is established a bowling alley and billiard table, the whole of which is screened and shaded by the native pine and other forest trees, forming a very pleasant and quiet spot for retirement or recreation.

This fountain, together with the Columbian, constitute all the mineral waters that have come into notice in this direction from the Congress. All the other fountains at this place are situated along the course of the valley, in a north-east direction.

HAMILTON SPRING.

THIS spring is situated in the low ground about fifty rods from the Congress, in a north-east direction, immediately in the rear of Congress Hall. It was discovered and named after the late General Hamilton by Mr. Gideon Putnam, one of the early settlers of the place, not long after the discovery of the Congress Spring. It was cleared out to the depth of only a few feet, and the water secured by a small wooden curb. In this situation it remained for a number of years, its waters being devoted mostly to the supply of a bathing establishment erected in its immediate vicinity. After the decease of Mr. Putnam, the property passed into other hands, and the well has been recently sunk to a much greater depth, and more effectually secured against the intrusion of foreign substances, by which means the water has been materially improved.

The surface of the water within the curb is constantly agitated by the escape of large quantities of gas; and as the water passes off, it leaves on the surface of the earth an abundant deposit of a

brownish colour, evidently ferruginous and calcareous.

The water, when first taken from the spring, is remarkably clear and sparkling; but, on standing exposed to the atmosphere, soon becomes turbid. It is saline and acidulous to the taste, and when taken to the quantity of five or six half pints, is usually cathartic and diuretic.

The temperature of the bottom of the well is uniformly at 50 deg., and its specific gravity at the temperature of 60 deg. and under a pressure of the atmosphere, indicated by the mercury in the barometer standing at thirty inches, is 1008.5, pure water being 1000.

The indications afforded by the application of tests correspond with those already noticed in the examination of the Congress water; and by pursuing a process similar to that adopted in the analysis of that water, the following ingredients were obtained from one gallon, viz.

	grs.
Chloride of Sodium,	297.3
Hydriodate of Soda,	3.
Bi-carbonate of Soda,	27.036
Bi-carbonate of Magnesia,	35.2

Carbonate of Lime,	92.4
Carbonate of Iron,	5.39
Hydro-bromate of Potash, a trace.	
Solid contents in one gallon,	460.326 grs.

Carbonic acid gas,	316
Atmospheric air,	4

Gaseous contents in a gallon, 320 inches.

This water ranks first among the springs as a diuretic, and it has long been celebrated for its good effects in gravelly and calculous affections. It is second only to the Congress in its saline impregnation, and is frequently used as a substitute for the water of the latter spring in all those cases where the irritable state of the stomach renders the more drastic effects of that water inadmissible.

In scrofula, and indeed all other indolent swellings of the glands, the water of this spring, together with that of the Columbian, will unquestionably take the preference; for, although they do not contain quite so large a proportion of the iodine as is found in the Congress water, they contain a much less quantity of other active saline ingredients, which render them less liable to affect the

bowels, and their effects upon the system generally are thereby rendered more certain.

It is, without doubt, owing to the iodine which these waters contain, that they have become so famous in the cure of strumous affections; and the water which contains the greatest abundance of this article, and is least encumbered with those substances that may tend to retard or prevent its effects upon the system, should unquestionably be directed as the most applicable in these complaints.

The Hamilton bath-house is erected close to this spring, and is supplied by it with water for its mineral baths, which are situated in secure and well furnished apartments, prepared either for shower bathing or immersing the body in the water, which may always, during the season, be procured either warm or cold. Fresh water baths are also furnished here for those who prefer them, and which should always be preferred in cases where the bath is used simply as a source of cleanliness. The rooms are sufficiently spacious and well ventilated, and the whole establishment is cleanly and well conducted.

FLAT ROCK SPRING.

FOLLOWING the course of the valley in a north-east direction from the Hamilton, about one hundred rods, we come to the Flat Rock Spring. It is situated directly in the rear of the Pavilion, on the verge of the marsh, at the foot of a steep bank which terminates the west side of the valley, through which a small brook passes. This bank is composed of argillaceous earth and sand, and is elevated about forty feet above the level of the brook.

The earth for some rods around this spring was formerly encrusted by a thick bed of *calcareous tufa*, which long exposure to the air had hardened into a pretty solid rock; and from this circumstance the spring received its name. This rock was neither more nor less than the usual sediment deposited by the water, combined with sand, leaves, sticks, &c. for which it was indebted to the wind and rain; and is no more than what happens about any of the fountains where the water does not find a ready egress, or is suffered to stagnate in their immediate vicinity. The progress of improve-

ment has, however, at this time nearly obliterated this natural platform, and the spot is now occupied by a tasteful little Chinese temple.

The well has been sunk to the depth of about fifteen feet, and a square tube made of plank inserted to its bottom. Through this the water rises to the surface of the earth and runs off in a small stream, depositing a copious sediment of a dark brown colour, along the whole extent of its course to the brook, which passes some rods distant.

The appearance and taste of this water very much resemble that of the Columbian, and the analysis, conducted upon the same principle, confirms the similarity.

Its temperature is 48 deg. and its specific gravity at the temperature of 60 deg. the barometer standing at 29.5 inches, is 1006.9, pure water being 1000.

One gallon afforded the following articles, viz.

Chloride of Sodium,	148.866
Carbonate of Lime,	60.573
Bi-carbonate of Magnesia,	42.7
Bi-carbonate of Soda,	20.79

Carbonate of Iron,	5.39
Hydriadate of Soda,	1.33
Hydro-bromate of Potash a trace in four gallons.	
Silix & Alumine a minute quantity.	
Solid contents in one gallon,	279.649 grs.

Carbonic acid gas,	287.5 cub. inch.
Atmospheric air,	6.5 inches.
Gaseous contents in a gallon,	294 cub. inch.

This water is used in all cases for which the Columbian is recommended. It has generally been considered one of the best chalybeate springs which the place affords, and on that account has been the most frequented. It is not improbable that there are cases in which this water will answer a better purpose as a tonic medicine than the Columbian, from the circumstance of its containing a greater quantity of carbonic acid, a less quantity of the saline principle, and at the same time containing an equal portion of the tonic properties.

HIGH ROCK SPRING.

Pursuing the course of the valley about one hundred rods further in a northerly direction, we come to the High Rock Spring; it is situated near the base of a ledge of calcareous rocks which at this place mark the westerly side of the valley.

The rock which gives the name to this spring, and surrounds and encloses the fountain, is of a conical shape, and apparently rests on the surface of the marl, or is but slightly connected with it. It narrows rapidly as it rises from the earth, and terminates in a rounded top, in the centre of which is a circular opening, which leads to the interior cavity. This hole gradually widens as the rock enlarges, leaving its walls nearly of an equal thickness throughout. In this cavity the water rises some feet above the surface of the surrounding earth, and is there seen constantly agitated by the incessant escape of carbonic acid gas, for which the vacancy above the water forms a capacious and secure reservoir, where the curious may at any time make the experiment of its deleterious effects on animal life.

This rock very justly claims a conspicuous place among the interesting natural curiosities which our country affords. The venerable Dr. Seaman in noticing this singular production observes: "The more we reflect upon it, the more we must be convinced of the important place this rock ought to hold among the wonderful works of nature. Had it stood upon the borders of the *Lago d' Agnano*, the noted *Grotto del Cani*, which burdens almost every book which treats upon the carbonic acid gas, since the peculiar properties of that air have been known, would never have been heard of beyond the environs of Naples, while this fountain, in its place, would have been *deservedly* celebrated in story, and spread upon canvass, to the admiration of the world, as one of its greatest curiosities."

The following dimensions of this singular production of nature were taken from actual measurement:

Perpendicular height, four feet.

Circumference at the base, twenty-six feet eight inches.

Length of a line drawn over the top, from north to south, eleven feet seven inches.

Length of the same from east to west, ten feet nine inches.

From the top of the rock to the surface of the water, ordinarily, two feet four inches.

Depth of water in the cavity of the rock, usually, seven feet eight inches.

The hole at the top is nearly circular, and measures ten inches across.

This rock belongs to that species of limestone termed *calcareous tufa*, being evidently the product of the water. It is composed of the carbonate of lime, magnesia, and the oxide of iron, together with a proportion of sand and clay. It likewise exhibits, when broken, the impressions of leaves and twigs of trees. It is somewhat undulated on its surface, and about the top compact and indurated, while near its base it is of a more spongy and friable character, but every where sufficiently compact to render it impervious to water.

That the water at some former period issued from the cavity and descended upon the sides of the rock, will scarcely admit of a doubt; but the precise manner in which the rock was formed, or the time when the water used to flow upon its surface, is not quite so obvious. The most probable conjecture is, that the basis of this mass was

commenced beneath the surface of the earth ; that the water, thus confined within the limits of its own sediment, continued to rise, and as it escaped over the sides of its prison, constantly added to the dimensions of its walls. In this manner it would continue to rise until the column of water in the rock balanced the power that forced it up, in which case it would become stationary ; and it is but just to infer, that in proces of time, the power so propelling the water might be diminished in its force, when the water in the spring would of course sink in exact proportion to the loss of that power.

There was an opinion prevailing among the early settlers, that the rock had been fractured by the fall of a tree, and to this accident they imputed the failure of the water to run over its top, believing that it escaped through a fissure, which, although invisible, they still imagined must exist. This conjecture, however, does not appear to have been well founded. The spring was visited as early as 1767, and no appearance to justify such an opinion then presented itself, although the water did not at that time reach the top of the rock by several inches.

Loran Tarbel, an aged chief of the St. Regis tribe of Indians, told the present Chancellor Walworth, that he visited this spring while a boy; and that he was told by the Indians that the water once ran over the top, but owing, as they supposed, to some of their women bathing in it when they ought not to have done so, the water sunk back into the rock and never showed itself again at the top.

The conspicuous appearance which this rock makes, must have introduced it to the notice of the natives at a very early period; and although it was probably known and visited by individuals whose business called them to the woods, it does not appear to have attracted much attention from the white population of the country until about the year 1767, when it was first visited by Sir William Johnson. From this period, "the spring" came more rapidly into notice, and for some years this was the only one to which much consequence was attached.

The extravagant stories told by the first settlers of the astonishing effects of this water in the cure of almost every species of disease, are still remembered and repeated by their too credulous descendants. This, in conjunction with the singular and

mysterious character of the rock, continue to attach an importance to the waters, in the eyes of the vulgar, at which no other fountain will ever arrive

The temperature at the bottom of the well is 48 deg., and its specific gravity at an atmospheric pressure, indicated by the barometer standing at 29.5 inches, is 1006.85, pure water being 1000.

One gallon of the water afforded the following ingredients, viz.

Chloride of Sodium,	189.10
Bi-carbonate of Magnesia,	61.592
Bi-carbonate of Soda,	17.538
Hydriodate of Soda,	2.5
Carbonate of Lime,	69.29
Carbonate of Iron,	5.58
Silix and Alumine, a small quantity.	
Hydro-bromate of Potash, a trace in four gallons of the water.	
Solid contents in a gallon,	345.68 grs.
Carbonic acid gas,	304
Atmospheric air,	5
Gaseous contents in a gallon,	309 cub. inch.

Since the discovery of the Congress Spring and the extensive improvements that have been made in that vicinity, the water of this fountain, as well as that of several others situated in its immediate neighborhood, have rather sunk into disuse, and the *old village*, as this part of the town is now termed, evidently discovers a correspondent desertion; but whatever may be the destiny of the place or the credit of the water, no means should be spared to protect and secure the rock. It has already suffered considerably from the depredations of unprincipled *specimen gatherers*, and it will be finally ruined, unless some more effectual method be adopted to prevent it.

PRESIDENT SPRING.

About thirty rods, in a northeastern direction from the High Rock, in the same valley, is situated the President Spring. The earth was removed to the depth of about four feet, when the spring was discovered bubbling up through the fissures in a stratum of lime rock, furnishing an ample supply of water in the wooden curb which was designed to protect and secure it. Within a few years this spring, like most of the others, has undergone considerable improvement by being more effectually secured against the intrusion of fresh water; since which period the temperature and specific gravity have become the same as that of the High Rock, and the analysis affords the same results. It is therefore probable that these two waters have their origin from the same source; for they are indeed the same water.

RED SPRING.

This spring is situated close to the public highway, about sixty or seventy rods in a north-eastern direction from the President. Large quantities of ferruginous deposits are found about it, and the water, when agitated, has numerous particles of fine sand stained with this substance floating about in it, which gives the water a red appearance, from which circumstance it receives its name.

Popular opinion has given much credit to the water of this fountain for its beneficial effects when applied to ill-conditioned ulcers and affections of the skin; and for the accommodation of those who may wish to use it in this way, a small bath-house has lately been erected close to the spring. The water, however, does not appear to possess any qualities to distinguish it from those which have already been described. Its saline impregnation is much less than any of the other springs, and its gaseous contents are still more deficient when compared with those of the other fountains.

Besides the several fountains already enumerated and described, there are some others of less notoriety located in the immediate vicinity, among which may be mentioned the Barrel Spring, not far from the High Rock, the Walton Spring, back of the Columbian Hotel, and the Monroe Spring, fifteen or twenty rods north from the Flat Rock. Both the former, however, are now entirely neglected ; but near the latter is erected a commodious bathing establishment, which this spring supplies with mineral water. It has likewise the convenience for fresh water bathing, and the house is cleanly and well attended.

TEN SPRINGS.

Pursuing the course of the same valley, about one mile from the High Rock in an eastern direction, we come to the Ten Springs, so called from the circumstance of there being that number located near together. These springs were discovered about the year 1814, on land that then belonged to Messrs. John and Ziba Taylor, and considerable pains were taken at the time to bring them into notice. Several of them were opened and secured by placing in them wooden boxes to keep out the fresh water, and a small bathing house was erected close to them. They never, however, acquired much celebrity, and the property having passed into other hands, but little attention is now paid to them; and it is probable, from their proximity to those so distinguished, that they will never rise into much consequence.

These springs are situated, like most of the others that have already been described, in a soil composed of argillaceous earth and sand, combined with the usual deposits, (iron and lime;) and they likewise contain the same constituent properties, differing only in the quantities of the articles which

they respectively hold in solution. Some of them are considerably saline, and being saturated with carbonic acid gas, they constitute a very pleasant beverage, and are much used by those who reside near by, both as a common drink and as a medicine.

ELLIS' SPRING.

About two miles from the Congress Spring, in a southwest direction, on land belonging to the heirs of the late Robert Ellis, is another mineral fountain which deserves notice. It is situated in a deep valley on the side of one of the principal branches of the Kayaderosseras creek, the banks of which, at this place, rise nearly fifty feet above its bed, and are frequently indented by deep ravines which open into the creek. The side of one of these ravines having been denuded for the purpose of erecting mills, furnishes a favorable opportunity for inspecting its structure; the arrangement of which is as follows: First,

A mixture of clay and gravel,	2 feet.
Coarse gravel and sand, with a great variety of small stones, generally smooth,	4
At the bottom of this stratum issues a spring of very pure water, which is never dry, and retains a temperature of 50 deg.	
Coarse gravel, sand and clay, with paving stones,	20

Per-oxide of iron, combined with sand and clay,	2 feet.
Clay and coarse gravel,	4
Lamellated slate, soft and crumbly,	3
Coarse gravel and clay,	4
Lamellated slate to the bed of the rock,	10

These strata are all placed nearly in a horizontal position, and are well defined.

The valley in which the mineral fountain discovers itself is of a semi-circular form, including the area of an acre.

Differing from all others of the kind, this water issues from the bank in a *horizontal* direction. It betrays its character the moment it approaches the surface, by its sparkling appearance, and the deposit of its iron, which stains the walls of the little rill, as it trickles down the declivity to the marsh, a few feet below, where it has formed a compact rocky substance, resembling in all respects, the *tufa* before described.

The water is remarkably clear ; its taste is acidulous and chalybeate, and its temperature is 48 deg. It affords 316 grains of solid contents to a gallon, which contents consist of marine salt,

carbonate of soda, lime, magnesia and iron; the last of which it affords in as great abundance as any of the mineral waters either at Saratoga or Ballston. It is indeed a very excellent chalybeate water; and as such it is in high estimation, although, in consequence of its remote situation, it is but seldom resorted to.

QUAKER SPRINGS.

In addition to the springs already noticed, there are several others which belong to the same class, situated in the town of Saratoga, about ten miles in a southeast direction from the Congress Spring; they are called the Quaker Springs.

These springs make their appearance through a bed of argillaceous marl, at the bottom of a deep valley, surrounded by gray-wacke and argillaceous slate. They contain lime, magnesia and iron, held in solution by the carbonic acid, and like the others, they likewise contain a portion of common salt and soda. Their gaseous contents are very small in comparison with those already described; and their mineral impregnation is not sufficient to entitle them to much attention, and they are of course but little resorted to.

BALLSTON SPA.

The village of Ballston Spa is situated about six miles in a southwest direction from the village of Saratoga Springs, in the southeast part of the town of Milton, and but a few rods from the north line of the town of Ballston. The great resort to this place, on account of its mineral waters, has made it like those of Saratoga, a place of much notoriety.

The mineral springs are situated in a marsh at the bottom of a deep valley, through which one of the principal branches of the Kayaderosseras creek passes. They were first discovered during the survey and partition of the patent of Kayaderosseras in 1769; and about the same time the Rev. Eliphalet Ball, from Bedford, Westchester county, with a number of his congregation, settled about two miles and a half from the Springs in a southerly direction, on a tract of land, which was set apart and sold to defray the expenses of the company in surveying the patent; and which,

from that time, has been distinguished by the name of Ballston.

In 1772, one Peter Ferris purchased and settled on a hundred acre lot, the second west from the springs ; and about the same time Benajah Douglass, who had resided some time previous near Lebanon Springs, (which at that time had become a place of some resort,) entertaining the belief that the springs at Ballston might become a watering place of some consequence, purchased a lot of one hundred acres adjacent to and directly west of the then principal spring, near which he erected a small log house for the accommodation of visitants. Encouraged by the success of this small beginning, Mr. Douglass, a few years after, was induced to build a small frame house across the creek, on the flat opposite the spring. At this period the waters had acquired a reputation of considerable notoriety, and they began to be resorted to by the inhabitants of the surrounding country, particularly from the city of Albany and the settlements along the valley of the Mohawk. Many came with their waggons, bringing their own provisions and forage, and staying several days, substituting the waggon for a boarding house. After the commencement of the war of the revolution, the settlement of the country was suspended,

and very little improvement was made at these springs until after the treaty of peace was concluded.

In 1791, Mr. Douglass erected a large building for the accommodation of visitants, the same which now constitutes the front of the excellent and well known establishment owned and kept by Mr. Aldridge. In 1792, Nicholas Low, Esq. of the city of New-York, the then proprietor of the lot on which the springs were situated, erected a large and commodious house close to the spring, which has been kept ever since as a boarding house, and has sustained a high reputation, well known as McMaster's boarding house. During the ensuing ten years, these establishments were much enlarged and improved, and several others were erected, and the springs now became the resort of great numbers of invalids, and also of the wealthy and fashionable.

In 1803, Mr. Low erected that splendid establishment so universally known and admired, the Sans Souci Hotel, and in the spring of 1804 it was furnished and opened for the accommodation of visitants.

In 1807, the legislature of the state passed an act incorporating the settlement at the springs, embracing one mile square, by the name of the Village of Ballston Spa.

About this time several springs were discovered in the vicinity of those already known, differing but little in their general character, with the exception of the *Sulphur water*, a few feet from the spring called *Low's Well*, and known as one of those called the *Sans Souci Springs*.

During the latter part of the summer of 1817, continued rains had so swollen the small stream which passes through the village, that it burst over its usual bounds, and in some places formed for itself an entire new channel. On the subsiding of the flood, a *new spring* was discovered, exhibiting an appearance which, connected with its medicinal properties, gave for a time much additional celebrity to the place. It was situated some rods below what was called the Public Well, and in what was, during the freshet, the bed of the stream. It issued from a circular opening of several feet in diameter, affording an immense quantity of water, attended with all the characteristics of a strong mineral impregnation.

With a view to prevent the connection of the water with the stratum of clay through which it passed up to the surface, and likewise to prevent the intrusion of fresh water, a tube was ingeniously constructed and forced into the aperture from whence the water arose, to the depth of nearly thirty feet. In this tube the water arose about five feet above the level of the brook, and was then suffered to fall over its sides, producing in some measure the effect of a *jet d'eau*, while the surface of the spring was brought nearly to a level with the eye, furnishing a fine opportunity for inspecting its sparkling properties to the greatest advantage. Close to the side of this tube another was inserted, not however to so great a depth, through which the water arose somewhat above the surface of the earth, and was then suffered to escape.

It was not a little singular that the waters of these two wells, apparently issuing from the same source, should have contained different portions of the *muriate of soda*, while they very nearly corresponded in all the other articles which they contained.

The water which flowed from these tubes, combined with that which came up in the aperture around them, ran off in a stream at the rate of more than a barrel a minute. It commenced the

deposit of its chalybeate and calcareous properties the moment it came in contact with the atmosphere, and the quantity given off by so large a bulk of water continued to mark its passage along the brook into which it passed for the distance of more than a mile.

This singular fountain continued about two years, the wonder and admiration of all who saw it and drank of its waters. At length, however, the abundant carbonic acid seemed to be exhausted, or to have taken some other course, and all attempts to reclaim it have as yet proved fruitless. The water still continues to flow in abundance, but retaining little or none of its mineral properties excepting its iron, which it still continues to hold in solution in considerable quantities. This was called the *Washington Spring*.

Not long after the first appearance of the last mentioned spring, it was thought by many that the old spring or public well on the flat had suffered a deterioration, there being evidently a much less evolution of uncombined gas than usual, and it is not improbable that the immense quantity of gas discharged at the place referred to might have operated to produce the apparent diminution at the old spring; the failure, however, has been by

some attributed to other causes. A desire to improve the condition and appearance of the well, about the same time, induced an officious interference with its situation, which better reflection and more experience would probably have caused to be omitted. These facts are recorded merely as matter of history, leaving the inferences to be confirmed or otherwise by future events. The water of the old spring, although it has suffered some in the public estimation, and is certainly not quite so palatable as formerly, is still an excellent tonic, sitting more easy and light on the stomachs of many than the waters of some of the other springs, which are more highly charged with the carbonic acid gas, which has the effect some times to produce distention of the stomach, and consequent vertigo and pain in the head.

In the year 1822, on removing an old floor and other rubbish under a building attached to the bathing house, a spring was discovered, or rather reclaimed, (for its existence had been known many years before,) apparently more saline than any which the place afforded; it now constitutes one of those called the *Sans Souci Springs*, and is situated about equi-distant from the one originally called *Low's Well* and the Sulphur Spring. It is now the spring mostly resorted to, particularly

by those who take the water as a beverage, or who desire its cathartic effect.

In the spring of 1827 an effort was made by a number of enterprising individuals to explore, by boring, the interior of the slate formation, with a view to obtain a further supply of mineral water at this place. To effect the object, a machine, invented for the purpose by Mr. Disbrow of New-Jersey, was procured, and operations were commenced on the flat nearly opposite to Aldridge's boarding house. The boring was begun in the bottom of a public well that had been previously sunk to the depth of fourteen feet, eight of which were in the rock. At the depth of about eighty feet a vein of mineral water was discovered; a tube was fitted to the hole in the rock of sufficient length to extend a little above the surface of the earth, and the water immediately rose to the top of this tube and escaped in a copious stream, affording an ample supply of a lively acidulous water. The excavation, however, was continued to the depth of one hundred and thirty-seven feet, but without any considerable addition to the water, either in quantity or quality, except a slight sulphurous impregnation. This spring has been named the *New Washington Fountain.*

Not long after the completion and establishment of this fountain, a most singular incident occurred that is thought worthy to be recorded. It exploded, with a loud noise and with such force as to throw the whole column of water contained in the well many feet into the air, leaving a distinct sulphurous odour, which continued for some minutes diffused in the surrounding atmosphere. The spring for a short time appeared entirely empty; but it soon filled again and resumed its original appearance, and has ever since continued to flow from a basin, which is now fixed to the top of the fountain. It is somewhat singular, that since the explosion, the sulphurous impregnation of the water of this spring has nearly or quite disappeared.

During the succeeding winter a similar experiment of boring was made, with nearly similar results, in a place called The Park, a little west from the Sans Souci and directly in the rear of the Village Hotel. The rock was struck at the depth of about thirty feet, through a bed of dark blue argillaceous marl. At about the same depth in the rock as in the former instance, a vein of mineral water was met with, very much resembling that of the last described fountain. The boring, however, was continued to the depth of two hundred and seventy feet, being about two hundred and forty

feet in the argillaceous or transition slate, which at this place forms the bottom of the valley in which all the above described springs are situated.

From the aperture thus formed, the water of this fountain now flows in great abundance, rising several feet above the surface of the earth, and presenting a beautiful little pool, which is tastefully displayed in a small basin secured to the top of the tube which conducts the water to the surface. It is an acidulous chalybeate of the first order, and must be regarded as an interesting and important acquisition to the place. It has received the distinctive appellation of the *Park Spring*.

These waters evidently belong to the same class with those already described at Saratoga ; and if they do not contain quite so large a proportion of the saline properties as some of the fountains at the latter place, which is very manifest both from the taste and the effects, they are unquestionably entitled to rank among the best acidulous chalybeate waters which this or any other country affords.

In order to examine these waters analytically, a quantity from each spring was secured at the fountain in well stopped bottles, conveyed to the

place of examination, and immediately submitted to the operation of tests. The whole of the experiments, both to determine the properties and to separate the different ingredients, were conducted in the same manner and upon the same principles as previously detailed in the examination of the Congress water; and the indications being in all respects the same, there occurring no perceptible difference other than what would naturally be supposed to result from the greater or less quantity of the various articles held in solution by each, it is not deemed necessary to recapitulate the dry details of these experiments in this place.

A quantity of the gas was procured from the water of each fountain, and submitted to the process of examination in the same manner as heretofore related at page 94. It was found, like that procured from the water at Saratoga Springs, to consist of pure carbonic acid, with an admixture of a small quantity of atmospheric air.

From repeated experiments on the water procured from the several springs at this place, there can be no doubt that they all contain considerable more than their bulk of carbonic acid gas; but not having the necessary materials for making the examinations on the spot, and the certainty that

the water parts with a considerable portion of the gas from being bottled, however carefully it may be done, no attempt was made to estimate with accuracy the amount of its gaseous product.

With these general remarks on the history, properties and character of the mineral waters at Ballston Spa, I shall now proceed to a particular examination of some of the principal fountains, or such as have from their medical properties acquired the most celebrity.

SANS SOUCI SPRING.

This spring is situated immediately in the rear of the *Sans Souci*, and is more familiarly known by the name of "Jack's Spring." Its history has been already related in the general remarks. Its water is sparkling and acidulous, and its taste highly chalybeate and somewhat saline.

The water from which the following analysis was made was procured from the spring in the fore part of the month of February, 1830, and during the winter following, 1831, the examination was repeated on different quantities of the water, with results perfectly corresponding. The processes adopted for determining and separating the various ingredients were the same in all respects as those detailed in the examination of the Congress water, a repetition of which is altogether unnecessary.

The temperature of the water at the bottom of the well, at a time when the thermometer stood in the open air at 20 deg. above zero, was 50 deg., and its specific gravity at the temperature of 60 deg. was 1005.7, pure water being 1000.

One gallon, or 231 cubic inches, of the water from this spring contains the following substances, viz.

Chloride of Sodium,	143.733
Bi-carbonate of Soda,	12.66
Bi-carbonate of Magnesia,	39.1
Carbonate of Lime,	43.407
Carbonate of Iron,	5.95
Hydriodate of Soda,	1.3
Silix,	1.
Solid contents in a gallon,	247.15 grs.

I have omitted to mention the presence of the *hydro-bromate of potash* in the above enumeration of the ingredients, because that substance is not satisfactorily indicated in one gallon of the water, as is the case with the same article in some of the springs at Saratoga ; but I have no doubt, that by concentrating a much larger portion of the water, its presence might have been demonstrated. This substance, together with that of the *hydriodate of soda*, seems in some way connected with the marine salt, the quantity being increased or diminished according as that salt is afforded in a greater or less abundance. The hydriodate of soda appears to be in the proportion of about one to a hundred

of the chloride of sodium, while the proportion of the hydro-bromate of potash is much less, and is scarcely to be detected in those waters that contain the greatest quantity of the marine salt; and in those which contain a much less quantity, it can only be demonstrated by concentrating several gallons of the water.

LOW'S SPRING.

This spring is situated near to the one just described, and its appearance and sensible properties are certainly not very dissimilar to it. Its specific gravity and its temperature, at the time I examined them, were the same; and as the application of re-agents indicated no essential difference in their constituent properties, they may with great propriety be presumed to be the same, or very nearly the same water.

PARK SPRING.

THIS fountain is situated in the immediate neighborhood of the two last described springs, in the rear of the Village Hotel. Its situation and history have already been described. The specific gravity is considerably less than that of either of the other two springs, and from the analysis, it affords a much less quantity of all the saline substances excepting the iron, with which this water is undoubtedly saturated. From one gallon I obtained 4.5 grains of the pure oxide of iron, equivalent to 6 ½ grains of the carbonate of iron, (a quantity unexampled in any of the other springs;) and the water not holding so large a quantity of the saline ingredients in solution, it constitutes one of the purest and best simple *acidulous chalybeate* waters which can any where be found; and in all cases where simple chalybeates alone are recommended, this water should undoubtedly have the preference.

THE PUBLIC WELL.

This spring is situated near the centre of the village, on the flat ground nearly opposite to Aldridge's boarding house. It was formerly the most distinguished of any which the place afforded, and it was ornamented and secured with a handsome iron paling and marble floor; but under an apprehension that the spring had suffered in its properties from the great pressure occasioned by these heavy stones, they have been removed without benefitting the water, and certainly without adding any thing to the beauty of the place.

Notwithstanding that this spring has, within a few years, suffered considerably in the estimation of the public, it is still much used, and is undoubtedly an excellent chalybeate water.

It has been generally asserted that "Sir William Johnson, in conveying the land at this place to individuals, reserved this spring for the benevolent purpose of serving the public." Where this story came from originally is not easy to tell; it is certain that Sir William never owned any land in

the vicinity of either of the springs. The title under which the lands at this place are held was obtained from the representatives of May Bickley, one of the original patentees, over which Sir William never had even the control of an agency.

THE NEW WASHINGTON SPRING.

This spring, like that last noticed, is situated in the street, a few rods distant, in a southerly direction.

The water submitted to examination was procured from the fountain in the month of February, 1831, and different portions of it were carefully examined under the same rules and regulations as already described. Its specific gravity is 1004.6, pure water being 1000, and its temperature 51 deg. ; and one gallon contains the following articles, viz.

Chloride of Sodium,	℈ 89.83
Bi-carbonate of Soda,	18.057
Bi-carbonate of Magnesia,	42.042
Carbonate of Lime,	41.51
Hydriadate of Soda,	0.7
Carbonate of Iron,	3.71
Silix and Alumine,	1.25
Solid contents in a gallon,	gr. 197.099

This well when it was first opened emitted a perceptible quantity of sulphuretted hydrogen, but it has now nearly or quite disappeared, particularly since the memorable event of its eruption, as before noticed. The gas, which it now emits in great abundance, is purely carbonic acid, probably combined with a small quantity of atmospheric air.

All these waters, if drank in large quantities, or taken by persons whose stomachs are rather irritable, operate as an aperient, and at the same time have a powerful effect as a diuretic, and are of eminent service in all those chronic affections where chalybeate medicines are indicated.

SULPHUREOUS WATERS.

Besides the acidulous saline chalybeate waters so bountifully bestowed on this county, there are several other mineral fountains of a different character; I allude to those springs which belong to the class termed sulphureous waters. There are several of this class which occur in the vicinity of the argillaceous slate formation, and they very probably owe their orign to the decomposition of the *iron pyrites*, or sulphuret of iron which abounds in this rock.

By far the most interesting and important spring belonging to this class is situated on the east border of Saratoga Lake, on a farm belonging to a Mr. Abel, about one mile south of Snake Hill, at the bottom of a deep ravine, which opens to the lake, and discloses a fine view of that beautiful sheet of water. The well is situated but a few yards from the beach; the water rises up through a bed of argillaceous marl, and diffuses its sulphureous adour in the atmosphere to some distance around.

The water is very limpid when first dipped, but on standing some time it deposits a small quantity of argillaceous earth, which when thrown on ignited coals, exhibits evidences of sulphur. This sediment is likewise deposited around the spring and along the course of its current.

It has a strong sulphureous and feted smell, nearly resembling that of bilge water, and it possesses an offensive nauseous taste ; it however becomes more palatable after drinking it a few times.

Strips of litmus paper plunged into this water fresh from the spring are slightly reddened by it, but the paper resumes its blue colour on drying.

Characters traced on paper with a solution of the acetate of lead, when plunged into water fresh from the spring, become nearly black, and they are made legible on suspending the paper a few minutes over the fountain.

Polished silver is immediately tarnished by immersing it in the water, and silver watches worn in the pockets of those who are in the daily use of it are said to be blackened by it.

The usual tests do not indicate the presence of any metalic substance in this water, nor are there any indications of lime, magnesia or marine salt; the constituent properties are purely sulphuretted hydrogen, together with a small quantity of alumine, which is diffused in it, but not in sufficient quantity to render it turbid.

Its temperature is 48 deg., and its specific gravity is but very little above that of pure water.

Doctors Armstrong and Johnson have lately given a new impulse to the use of sulphureous waters in the cure of visceral congestions and chronic affections of the digestive organs; and it is highly probable that a free internal use of the water of this spring, connected with some mild laxative medicine, will be found highly serviceable in a great variety of those afflictive complaints.

Baths might easily be constructed here, and the water conducted directly into them from the fountain, which produces a sufficient quantity for a constant supply. Bathing in waters of this description has long been celebrated for its efficacy in the cure of a great variety of eruptive and other diseases of the skin; and it is highly probable that this spring will ultimately become an important ap-

pendage to the distinguished waters of Saratoga and Ballston, from either of which it is but a few miles distant, and the ride includes all the variety of scenery presented by the lake and its environs.

In the valley of one of the branches of the Kayaderosseras creek, about two miles westerly from the village of Saratoga Springs, is another strongly scented sulphureous spring; it rises perpendicularly from the earth in a stream sufficient to turn a mill, at the bottom of a steep bank, composed of sand, clay and coarse gravel.

The approach to this spring is discovered at the distance of some yards, by the sulphureous odour with which it impregnates the atmosphere. The water is clear, and but triflingly agitated by the escape of gas; its taste is unpleasant, not unlike the washings of a rusty gun barrel. It deposits a brown sediment, which marks its passage to the creek, a distance of one hundred yards.

Its temperature is 50 deg. while that of a fountain of pure water which issues from the same bank in a horizontal direction, and within ten feet of it, is at 46 deg.

In addition to the sulphuretted hydrogen which this water affords, it contains a small proportion of carbonic acid gas, and is slightly impregnated with marine salt, iron and lime. It is highly extolled for its efficacy in the cure of eruptive diseases, for which it is used, both internally and externally; but owing to its remote situation, and the want of proper accommodations, it is but little resorted to at present.

At Ballston Spa, situated within a few feet of the Sans Souci fountain, there is a spring which has received the name of the *Sulphur Spring*. It is a weak, saline chalybeate, containing a small quantity of sulphuretted hydrogen gas, which is sufficiently apparent both from the smell and taste. Its sulphureous impregnation, however, does not appear to be sufficient to make it very important on that account. It is much used for bathing, and is recommended and used in a great variety of cutaneous affections.

PRACTICAL OBSERVATIONS

ON THE

MEDICAL PROPERTIES

OF

THE WATERS.

I shall conclude my remarks on the waters of these fountains, by a few general observations on their medical properties, and their application in the various diseases for which they have become so deservedly celebrated.

These waters are so generally used, and their effects so seldom injurious, particularly to persons in health, that almost every one who has ever drank of them assumes the prerogative of directing their use to others; and were these directions always the result of experience and observation, they would certainly be less objectionable; but there are numerous persons who flock about the springs during the drinking season, without any knowledge of the composition of the waters, and little or none of their effects, who contrive to

dispose of their directions to the ignorant and unwary, with no other effect than to injure the reputation of the water and destroy the prospects of the diseased.

Many persons who resort to the springs for the restoration of health, seem to be governed by the idea, that they are to recover in proportion to the quantity they drink; and, although many who are in health may, and frequently do, swallow down enormous quantities of the water with apparent impunity, it by no means follows that those whose stomachs are enfeebled by disease can take the same quantity with the same effect. Stomachs of this description frequently reject large portions of the water, and thereby protect the system from the disastrous consequences that would otherwise follow. But when it happens to be retained, the result is indeed distressing; the pulse becomes quick and feeble, the extremities cold, the head painful and dizzy, the bowels swollen and tender, and the whole train of nervous affections alarmingly increased; and should the unfortunate sufferer survive the effects of his imprudence, it is only to a renewal of his worst apprehensions, from a loss of confidence in what he most probably considered a last resort.

In directing the use of the waters, I shall confine my remarks to a few observations on their medical application, of a *general* character only; particular directions can only be given with safety to the patient from a careful investigation of the particular symptoms, character and nature of the complaint.

Among the great variety of invalids who resort to the springs, none perhaps receive more essential and effectual benefit from their use than those usually termed BILIOUS.

In all those affections usually termed *bilious*, if the attack be recent and unattended by any serious organic affection, it is most usually removed in the course of a few days by a free use of the Congress water alone; but in those cases where the functions of the stomach and bowels have become impaired from the long continuance of the disease, attended with anasarcus swellings of the extremeties, &c. although the waters of this fountain may be resorted to with nearly the same assurance of obtaining relief, nevertheless more caution is indispensably necessary in its administration; for should a great quantity of the water be drank without having the proper effect by the bowels and kidneys, it is never beneficial, but on the contrary,

frequently increases the most alarming symptoms of the complaint.

In cases of this description, I have long been in the habit of recommending the addition of some mild cathartic medicine; and for this purpose a few grains of calomel, or the blue pill, are directed to be taken over night, followed in the morning by a sufficient quantity of the water to move the bowels briskly two or three times, with the happiest effect. A few doses of this description usually puts the bowels in a situation to be more easily wrought upon by the water, and the patient becomes convinced of its efficacy in his disease from a few days proper application.

In the more advanced stages of bilious affections, where the organization of the liver and other viscera have materially suffered, and the disposition to general *hydrops*, indicated by the enlargement of the extremities, fullness of the abdomen, &c. the waters are all of them manifestly injurious, and are not to be admitted, even as an auxiliary remedy.

In all those functional affections of the organs employed in the process of digestion, constituting what is usually termed DYSPEPSIA, the waters have

long maintained a high and deserved reputation. The Congress water is principally relied on for the cure of these affections. This should be taken in the morning, an hour or two before breakfast, in sufficient quantity to move the bowels freely once or twice. In ordinary cases, four or five tumblers full are sufficient for the purpose; and in weak irritable habits, half the quantity, or a single tumbler full in some cases, is amply sufficient to answer the purpose.

In those cases where the bowels are attended with an habitual constipation, the large quantity of water required to move them often produces unpleasant distention of the stomach and bowels, and by producing cold chills and nausea, frequently defeats the general intention of its application. This, in some instances, may be remedied by simply elevating the temperature of the water by keeping it for some hours in well stopped bottles in a warm room. When this fails, recourse may be had to some suitable laxative, which should be taken over night on going to bed; and a much less quantity of the water in the morning will answer the wishes of the patient, without subjecting him to any very great inconvenience. Or, if circumstances require a still greater effect, a little epsom, or some other laxative salt, may be added to the first

glass of the water. In this way the difficulty will soon be overcome, when a much less quantity of the water will be found to answer the purpose.

But the Congress water is not alone to be depended on for the removal of these affections: when the stomach and bowels have been properly cleansed by the mild and innocent purgative properties of this water, for which purpose it is to be drank only in the morning, the remainder of the day should be devoted to the moderate and discreet use of some of the more pure chalybeate waters: as that of the *Flat Rock*, *Columbian*, *High Rock*, *Ellis' Spring*, or *Ballston Spa*.

The quantity of water from either of these fountains, to be used daily, must necessarily depend in a great measure on the state of the disease and the condition of the stomach. It is therefore best to commence their use in small quantities at a time, and at distant and regular intervals; gradually increasing the quantity and frequency of the draught, as may be most agreeable to the stomach, and least unpleasant to the feelings. In this way the quantity may be increased to from one to two quarts; and it is questionable whether a much larger quantity may be drank with any additional advantage.

The use of chalybeate medicines in the cure of the deranged state of the digestive organs has seldom been directed, except in conjunction with laxatives of some kind; and it is now a subject of speculation with some of our best and well informed practitioners, whether the cure might not be as expeditiously effected by the judicious administration of laxatives alone. It is certain that three fourths of the cases usually termed *dyspeptic*, which congregate at these springs during the drinking season, owe their origin to the ill-timed admini tration of chalybeates and other *tonic* remedies, prescribed for the purpose of bracing up what was supposed to be a *debilitated stomach;* or in more familiar terms, "*to wind up a run down constitution.*"

"From long and unbiassed observation," says the venerable Doct. Armstrong, "I am fully convinced that most of the medicines called *tonics* are either useless or pernicious; and if these were erased from the pharmacopœias, it would be a real benefit to the profession and mankind; for they only serve to mislesd the former, and to tantalize or injure the latter. Tonic medicines generally oppress the digestive functions, or operate as direct stimulants, and in either case they are improper in convalescence; for by the first they may de-

stroy the natural appetite, and by the last they may lead to chronic inflammations. So far from such drugs being appropriate to a stage of convalescence from acute disease, mild laxatives are most frequently requisite to preserve a right balance between the ingesta and the egesta; and the practitioner who substitutes the former will find that his patients will pass better through convalescence, and be afterwards far less subject to consecutive attacks of inflammation." These remarks are so much in accordance with my own experience and observation, that I could not forego the opportunity of transcribing them here.

But whether the tonic medicines be or be not appropriate in the cure of the deranged state of the digestive organs, it is certain that the quantity of iron found in the water of those fountains which contain the largest proportion of that article, is quite too trifling to merit a serious consideration as a remedy in any disease. That the waters possess powerful stimulating and exciting powers cannot be disputed; but whether this property be owing to the small portion of iron, as is usually supposed, which enters into its composition, may very rationally be doubted.

Conjoined with the internal use of the waters, bathing should not be neglected ; its exhilerating effect upon the surface of the body contributes much to the restoration of the vigor and strength of the stomach. The *cold shower bath* should always be preferred where the energy of the circulation is sufficient to overcome the effects of the cold, and produce the sensation of warmth over the surface immediately after its application ; where this sensation is not produced, the cold bath should be dispensed with, and the tepid or warm bath substituted in its stead, together with general friction with a flesh brush or coarse flannel over the whole body.

The stimulating effects of these waters, arising from their saline and gaseous properties, give them a decided preference over any other as a bath ; and those who are laboring under a deficient or irregular action of the cutaneous vessels, arising either from a sympathetic affection with a diseased stomach, or from an original affection of the vessels themselves, will find it to their advantage to persevere in its use under this form.

The idea of bathing before sunrise or early in the morning is entirely wrong. Before bathing, the system should always be invigorated by the ef-

fect of moderate exercise and a nutricious repast. The hour of ten or eleven in the forenoon is therefore the most suitable time for its application.

In CALCULOUS and NEPHRITIC complaints the waters have long been celebrated for their efficacy, and numerous well attested instances of their good effects can be produced, where the disease was not only benefitted, but effectually cured. In these cases, the subjects of them, after using the water for some weeks, voided large quantities of sand and small gravel, and have since felt no symptoms of the return of the complaint.

The waters that would seem to promise most in these diseases are those which contain the greatest quantity of the *ærated alkali*, but they have usually been drank indiscriminately for this purpose, without reference to any particular fountain ; it is therefore probable that the carbonic acid, together with the carbonated earths, add something to the *lithontriptic* properties of these waters.

They should be drank in such quantities as to keep the bowels open, and repeated sufficiently often to keep up an increased secretion by the kidneys.

The *warm bath*, as an auxiliary to the internal use of the waters, is of much importance; it greatly facilitates the passage of the ragged fragments of gravel which sometimes take place from the effect of this remedy. Its temperature should be from 100 to 110 deg. and the length of time proper for continuing it should be from one to two hours.

In CHRONIC RHEUMATISM, the virtues of the waters were known, and celebrated, by the aborigines; and the observations of more modern visitants have tended greatly to confirm the good opinion entertained by the original proprietors. The Congress water has the most celebrity in this disease: it should be taken in the morning, in sufficient quantities to move the bowels two or three times, and followed by moderate draughts of some of the other fountains; and in most instances, the shower bath will add much to the efficacy of the water. Following this course for a length of time gradually relaxes the rigidity of the muscles, adds strength and facility of motion to the diseased joints, and restores ease and vigor to the whole system.

The ANTHRITIS, or GOUT, has but seldom appeared at the Springs. Whether this absence is to

be imputed to the few cases that, comparatively speaking, occur in our country, or to a prevailing opinion, that the use of the waters would be injurious, is uncertain. If, however, one may be allowed to judge from the few cases which have appeared at the waters, there is some reason to believe they may prove highly serviceable, particularly in the incipient or forming stage of the complaint; but in those cases where the disease has become confirmed, and the system, for a long time, has been subjected to a course of powerful stimulants, the operation of the waters is more doubtful; and indeed several instances have occurred where their use evidently tended to invite a recurrence of the paroxysms.

In PHAGEDENIC, or ILL-CONDITIONED ULCERS of the extremities, perhaps no application has ever been attended with more effectual benefit in a variety of these affections than a free use of the waters; but the various forms and circumstances under which this afflictive complaint presents itself require particular attention, as they form the only criterion for a proper application of this highly useful remedy.

Persons afflicted with obstinate and painful CUTANEOUS ERUPTIONS derive great and important

benefit from a properly directed course of bathing and drinking. And in that peculiarly relaxed and enfeebled state of the system arising from a long protracted *mercurial course*, the water connected with the air and exercises of the country, has never failed of proving an efficacious and speedy restorative.

Scrofula is another disease for which those who are afflicted with it frequently become applicants to the waters, and experience has abundantly sanctioned the belief of their utility in that complaint.

Before the discovery of Iodine in these waters, their operation in the cure of strumous affections was considered as somewhat mysterious, but since that substance has been demonstrated as forming one of the constituent ingredients in the water, the mystery has been solved, and the waters are now prescribed in these affections with a confidence which the important and active properties of this interesting article is calculated to inspire.

As Iodine is a substance which has been recently introduced into the list of valuable remedies, a short notice of its history and medical character

will not be uninteresting, particularly to the general reader.

This singular and interesting article was first discovered by a manufacturer of saltpetre at Paris, no longer ago than 1812. In washing the carbonate of soda from the ashes of sea-weeds, he observed that the risidual liquor corroded the metalic vessels in which it was standing, and on the addition of sulphuric acid he obtained a dark coloured precipitate, which was converted into a beautiful violet coloured vapour by the application of heat. Some of this substance was put into the hands of M. Clement, a distinguished chemist of Paris, who soon recognized it as a new body; and in 1813 he first described it in the royal institution of France. Sir Humphrey Davy, Gay-Lussac, and a number of other distinguished chemists, have subsequently investigated its chemical habitudes, and determined its real nature.

Iodine, in a pure state at the ordinary temperature of the atmosphere, is a soft, friable, opaque solid, of a blueish black colour, somewhat resembling plumbago. It occurs usually in crystalline scales; it sublimes rapidly at a temperature even below that of boiling water; and it suffers a gradual dissipation at a still lower temperature. Its

vapour is of a rich violet colour, from which circumstance it has received the name of IODINE. It has a very acrid taste, and a strong offensive odour. It acts with great energy on the animal system, but may be employed with advantage as a medicine in very small doses.

It unites chemically with oxygen and hydrogen, forming the iodic and hydriodic acids; and these, when united with the alkaline, or earthy basis, constitute the iodates, or hydriodates; and in one or other of these forms it is usually met with in nature.

The hydriodic acid combined with potassa or soda, has been detected in many of the brine and other mineral springs of Europe. It has likewise been found in sea-water, and a number of marine animals; and it is contained in sponge, and a great variety of sea-weed; and its existence in the waters of Saratoga and Ballston Spa, in the state of the hydriodate of soda, has been satisfactorily demonstrated.

As a medicine, Iodine is now believed to possess great and important qualities; and it has been introduced as a remedy in the cure of almost every species of chronic affection. It is supposed to

exert a special influence over the *absorbent* or *lymphatic* system; and in goitre and scrofula, as well as all other indolent enlargement of the glands, it has maintained a high and deserved reputation. And it is unquestionably owing to the presence of this substance that the mineral waters of Saratoga are indebted for their great efficacy in the cure of strumous affections.

The fountain which contains the largest proportion of the hydriodate of soda, should, without doubt, be selected by the invalid laboring under these afflictions. The water should be commenced in small doses, and the quantity gradually increased, as the stomach will bear it; and its use should be continued, at least, through the summer months. There are but few of this description who have not received advantage, and numerous instances might be adduced where the less seriously affected have perfectly recovered from a proper course of bathing and drinking.

Bromine* is another substance that has lately been discovered as entering into the composition of these waters; and it is not improbable, from

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* This substance was discovered in sea-water, by a French chemist in 1826. It is in a liquid state at the common temperature of the atmosphere; its color is a blackish red; its odour

the highly active properties which it is known to possess, that in conjunction with iodine, it contributes to the efficacy of the water in its operation on scrofulous and enfeebled habits; but the extremely minute quantity in which it is found forbids the idea of attaching much importance to its presence.

In DROPSY, arising from organic derangement of long continuance, the waters are manifestly injurious, as they invariably increase the swelling, and add to the sufferings of the patient; but in recent cases, where the affection arises simply from a deficient action in the absorbent vessels, the water has a singular effect in removing it. It should be drank in the morning freely, so as to produce a copious discharge from the bowels; and through the day taken in such quantities as to keep up a pretty constant discharge of urine. The bloating is relieved immediately, and a proper continuance of the water will finally establish the permanency of the cure.

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is disagreeable, and its taste powerful. It acts with energy on organic substances and corrodes the animal texture. It has been detected in most of the substances in which iodine has been found. It exists in sea-water in the state of the hydro-bromate of magnesia, and in the waters of this place it is in the state of the hydro-bromate of potassa.

In PARALYSIS, the waters have been usually serviceable. The purgative properties of the Congress render it the most applicable to this disease; and its good effects are much increased by the use of the bath.

In CHLOROSIS, and a variety of other complaints peculiar to the female sex, the waters maintain a high and deserved reputation. In most of these cases the bowels should be kept open, by the use of the more purgative waters; and those of a less purgative character should be persevered in for a length of time. Their good effects will be much accelerated by frequent bathing and moderate exercise.

"The general operation of chalybeates," says Dr. Saunders, in his treatise upon the mineral waters of Europe, "is to increase the power of the secretory system in a gradual uniform manner, and at the same time by the permanency of their stimulus, or some other cause with which we are not well acquainted, to impart a gentle and salutary increase to the body, of strength, tone, nervous energy and general vigor of all the functions. It is therefore chiefly in chronic disorders, in those that arise from slow beginnings and are attended with great laxity and debility of the solids, but

without much organic disease, that these waters are found to be particularly useful."

In PHTHISIS, and indeed all other pulmonary affections, arising from primary disease of the lungs, the waters are evidently injurious, and manifestly tend to increase the virulence of the disease. Their use, therefore, in these complaints, as well as in all acute or inflammatory diseases, should be strictly prohibited.

The season of the year most suitable for drinking the waters is often made a subject of earnest inquiry. The summer months, or during the prevalence of warm weather, is undoubtedly the most suitable time for their use, as cold drinks are then far more agreeable, both to the stomach and palate; and all the secretions and excretions of the system, in ordinary cases, are then more readily and effectually operated on by the effects of remediable agents. But what is of still more importance, the summer season is more particularly adapted to a free and unrestrained exercise in the open air; without which a long course of the waters would be of but little avail.

The great number of visitants who frequent these watering places during the season for drink-

ing, are no doubt a source of considerable income to the country; but the annual increase of *poor invalids*, who flock here from all parts of the United States, and are solely dependant upon private munificence for their subsistence, is an evil that begins to be seriously felt, not only by the inhabitants, but by strangers, whose benevolence, while here, is daily laid under contribution for the support of some *poor object*, who is struggling to obtain from bountiful nature a renovation of health which he has lost, perhaps, in the service of his country. This evil can only be properly remedied by an interference of the general government; and I cannot omit this opportunity to remind those whose business it may be, that the endowment of a small *hospital* at this place, under proper regulations, would be attended with more beneficent effects, and would tend more to ameliorate the condition of suffering humanity, than the appropriation of an equivalent sum in any other way could possibly produce.

Much interest has been excited on the subject of the source of these singular and interesting waters, but no researches have as yet satisfactorily unfolded the mystery. The large proportion of common salt found among their constituent properties may be accounted for without much difficul-

ty, all the salt springs of Europe as well as those of America being found in geological situations exactly corresponding to these ; but the production of the unexampled quantity of carbonic acid gas, the medium through which the other articles are principally retained in solution, is yet, and probably will remain, a subject of mere speculation. The low and regular temperature of the water seems to forbid the idea that it is the effect of subterranean heat, as many have supposed, and the total absence of any *mineral acid*, excepting the marine which is combined with soda, does away the possibility of its being the effect of any combination of that kind. Its production is therefore truly unaccountable.

FINIS.